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ABSTRACT

The Southern Rural Development Center in cooperation with the University of Kentucky sponsored a workshop which brought together extension and research personnel interested in rural economic development concerns (i.e., inadequate water supplies, sewer systems, and schools). The proceedings include "Community Growth Management: The Land-Grant University Perspective," C. Oran Little; "Community Growth Strategies for the 80s," William W. Linder, Gerry H. Williams; "Economic-Demographic Impact Assessment Models: Characteristics and Considerations in Adaptation and Development," Steven H. Murdock, et al; "An Interactive Approach for Community Development Decisionmaking," David L. Debertin; "The Economic Impact Assessment Model (EIAM), A County Level Economic Impact Assessment Model," R. C. Winter; "A Pen and Pad Procedure for Estimating Community Economic Impacts," John Gordon; "Policy Simulation with the South Carolina Impact Model," Mark S. Henry; "The Texas Assessment Modeling System (TAMS): A Methodology for Projecting Socio-economic Impacts of Lignite Development in Rural Texas," Lonnie L. Jones, Steven H. Murdock; "A User-Oriented Computerized Fiscal Impact Model," Lonnie L. Jones, Mike D. Woods; "A Community Level Simulation Model for Rural Development Planners," Gerald A. Doeksen, et al; "Results for Community Impact Model Case Study," Mike D. Woods, Gerald A. Doeksen; and "Community Impact Model: Workshop Example," Mike D. Woods, Gerald A. Doeksen." (AH)

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COMMUNITY IMPACT ANALYSIS
UNIVERSITY OF KENTUCKY - MAY 24-26, 1982

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Proceedings of the Workshop on

COMMUNITY IMPACT ANALYSIS

Lexington, Kentucky
May 24-26, 1982

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University of Kentucky

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PREFACE

Analyzing the impact of growth has become a priority for Sunbelt states experiencing rapid population and economic expansion. Problems such as inadequate water supplies, sewer systems, and schools have become commonplace in the South as the region experiences strains on its capacity to serve enlarging communities.

The impact of various patterns of growth and decline can be determined through the use of impact analysis models. These models can predict economic, demographic, public service and fiscal impacts of policy decisions contemplated by community decision makers.

In response to the growing need for an exchange of ideas relating to growth impact analysis, the Southern Rural Development Center in cooperation with the University of Kentucky sponsored a workshop to bring together extension and research personnel interested in rural economic development. This volume is the proceedings from the workshop.

The workshop program included presentations from extension and research representatives who use impact analysis models within their own states. Other states can modify these approaches and use them to aid their local officials in coping with the mixed blessings of growth. The final objective of this effort is a better quality of life for the people who live in small communities and rural areas of the South.

COMMUNITY GROWTH MANAGEMENT:
The Land-Grant University Perspective

C. Oran Little
University of Kentucky

On behalf of the College of Agriculture may I welcome you to Kentucky and to the University of Kentucky. We are pleased that the Southern Rural Development Center has organized this workshop dealing with community impact analysis; we are pleased that this land-grant university could serve as host for the workshop; and we are pleased that each of you are here with a sincere interest in doing a better job of serving a most vital part of our society.

Just as agricultural means different things to different people, rural development has varying interpretations to each of us depending on personal background, experiences and responsibilities. To some, agriculture is soil and water and crops and livestock, to others it is an occupation and profession, and to others it is a way of life. Actually, agriculture is all of these and more with people as the central component, people associated with common elements of food and fiber. In this consideration, perhaps rural development might well be perceived as the interrelations of the many parts of agriculture.

My early background and experiences associated with this subject relate to a small farming community. It was no secret, in fact, there was considerable pride that the economy of the area was almost totally tied to agriculture. There was also pride among the people that a major corporation had chosen that community in which to construct a canned condensed milk plant. This plant provided jobs and it provided an expanded market for a large number of farmers. I personally experienced such community growth activities as consolidation of the school system, establishment of a central water supply with Public Health approval, construction of new "farm to market" roads; and I participated in many youth activities organized and sponsored by community leaders and merchants. But association wth rural development, land-grant universities, or research and extension were not really a part of my percepton. To me this was simply a viable community with a living and working environment that was satisfying for people.

More recently in an administrative role my association with this subject has come with different perspectives. We study rural-urban population shifts and develop programs to improve "quality of life" in rural areas. We hear accusations that mechanization is at least near the top of the list of all evils and observe efforts to declare a moritorium on all agricultural mechanization research but identify increasing pressures to improve efficiency of production and supply-demand stability. We speculte on basic structural changes in the rural sector of society. We advance the application of science and technology to analyze and project impacts on change and recognize increasing urgency for answers relating to resource conservation, land conversions and transportation. We find ourselves having to deal with strong public opinion which erroneously implies that agriculture is a declining industry when it is increasingly evident that the economic and social stability of mankind will depend heavily on advancements in providing food and fiber.

To meet this challenge we must have capable people, excited, happy and working hard in growing and well managed communities. Our land-grant universities through the research and extension programs are uniquely qualified to serve this need. We are capable of providing the glue to bring together all of the pieces. We must be involved for these communities to gain information and perspective, to be articulate about needs and opportunities and to resolve issues. We must have a selfish interest to be intelligent in the organization and operation of our rural communities. Rural development and community management as I perceive it must be a high priority on our research and extension agenda.

Most of you are already deeply involved in various programs relating to growth management. During the course of this workshop you will undoubtedly expand on these and certainly identify new possibilities. May I simply list a few of the program elements of concern:

1. Overall patterns of economic and social activities
2. Facilities and services
3. Transportation
4. Advancing technologies
5. Resource conservation and utilization
6. Land use considerations

Time will not permit my further discussion of these elements now; however, they are areas that always seem to surface as we look ahead. I would point out that each is distinctly different but all are interrelated as to impact on community growth management.

Let me also offer a few words of personal observation and challenge to each of you. I place rural community growth management high on the priority list for research and extension and recognize an excitement in developments relative to impact analysis. I am confident that the Land-Grant University System shares in this assessment. As you evaluate the importance of your work, look at the possibilities and potentials. They can be tremendous, and I urge you to move ahead. Recognizing inherent problems with spreading efforts too thin, I encourage you to work together in identifying a primary focus; do a complete job of generating a knowledge base, interpreting the information and disseminating to users. Success spawns visibility and further support. In the true Land-Grant tradition we must provide sound information based on fact in a mode of education and challenge local leaders to make appropriate decisions. Finally, we must maintain a tough-minded optimism and confidence in what we are doing and not change direction with the winds of popularism.

Again, I am pleased that you have elected to be a part of this workshop and thank the Southern Rural Development Center as sponsor.

Rural Development is not a dying issue. It is a greater challenge today than ever before and let's give it the kind of effort befitting its importance. I am confident that you will gain new insights and lay the ground work for more productive programs as these days progress. Thank you.

COMMUNITY GROWTH STRATEGIES FOR THE '80S

William W. Linder
Gerry H. Williams
Southern Rural Development Center

The decade of the 1980s will be a time characterized by limited resources. Communities will be forced to be innovative and, at the same time, careful in their decision making regarding economic development since their resources must be allocated to several areas of need. Localities will no longer be able to afford a simplistic approach toward economic development - every effort must be made to ascertain the optimal types of development for an area. More specifically, communities will need to utilize some type of impact analysis models to determine whether or not a new business or the expansion of an existing firm or other type of economic development event will deliver a positive return on the public investment. Limited resources will tend to reduce the use of criteria that are not readily quantifiable - i.e., community values.

Demographic changes in our society will modify public service demands and the ability of recipients to pay for services during the 1980s. These changes will affect the direction of economic development in communities. Certain demographic trends are already in process, and communities must identify these trends and be prepared to cope with the resulting changes. Some significant trends already in process are: (1) smaller, often fragmented households are becoming more prevalent - non-family and one-parent households are increasing in numbers; (2) two-earner families are increasing sharply - it's projected by 1990 that nearly 60 percent of couples will have two adult wage earners; (3) America's age of profile is lumpy - there are uneven concentrations of population at certain ages; (4) population shifts between regions are occurring nationwide; and (5) migration from urban areas to smaller communities is occurring nationwide. Without question, forces are gathering on the horizon which will force America's communities to become involved in serious efforts to allocate their resources in ways that would be the most suitable in managing their growth or decline.

Having outlined the likely environment of the '80s in general terms, we will move on to the discussion of possible strategies for coping with growth and/or decline for the decade.

One of the most important strategies that might be utilized by communities in coping with growth (or decline) is the use of economic impact analysis models. These analytical tools offer communities a means of evaluating quantifiable variables that could affect a community's decision regarding an economic development event. For example, a properly designed impact model can estimate the impact of a new plant on area employment, housing, government revenues and expenditures, and

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other factors relevant to the decision-making process necessary for community planning; or it can identify the costs and benefits associated with the expansion of an existing business. Impact analysis models can also be used to determine the impacts of government programs or the impact of the loss of government programs such as social security pensions. Impact analysis models are not panaceas. They are limited in that they can only measure quantifiable data and provide estimates or projections of future social and economic conditions in a community. It is important that local decision makers recognize the limitations of this type of analysis.

Some other strategies may be beneficial to local governments at a time of increased (or decreased) demand for services. Communities may contract with other governmental units or with private businesses to deliver services that were formerly the responsibility of the public sector. Some of the advantages of contracting for public services are: (1) private firms can sometimes be more efficient and operate at less cost than public agencies; (2) private firms offer a means of escape from over-bureaucratization and public labor-management problems; (3) private firms have greater flexibility in the use of job incentives; (4) contracted services can be easily reduced or eliminated should the need for a service be phased out; and (5) private firms sometimes aave a better understanding of economies of scale and specialization. In a time of fiscal austerity, such as we have today, many cities are contracting with private firms to provide for garbage collection and disposal, street maintenance and construction, public transit, and other services. Contracting services works better in some areas than others; consequently, contracting for services is not an option in every case. Along the same vein, local governments may lease facilities or equipment from private businesses or individuals. With interest rates as high as they currently are, leasing can be an economical alternative to an expensive long-term capital investment for a community.

Utilization of user charges is another strategy that is growing in popularity. The use of fee-for-service charges often improves access to capital markets because of the guaranteed flow of revenues. A GAO analysis of the need for additional Federal aid for urban water systems concluded that management was better where user charges were utilized. In the Southwestern United States, the sale of municipal water often constitutes a principle source of revenue for smaller communities. The primary disadvantage of user charges (fees) is that they do impact more heavily on low-income citizens such as elderly people on fixed incomes; however, special adjustments may be made for lower-income households. The financial management strategies mentioned above offer alternatives to more traditional approaches toward accommodating economic development.

Land-use/public policy strategies offer another means of shaping development within a community. There are several strategies within this broad category. Perhaps the most controversial of these groups is public regulation. Included in public regulations are zoning ordinances, subdivision covenants, health, housing, plumbing and electrical codes, nuisance laws, and pollution control regulations.

The most prominent tool for land-use control is zoning. Zoning specifies areas within a community which a prescried land use (or uses) is allowed. The most glaring weakness of zoning as a strategy to control development is that local agencies charged with enforcing zoning ordinances are subject to pressure from special interest groups such as builders and realtors. Sometimes those persons charged with formulating ordinances, through lack of foresight, draw up ordinances that actually inhibit desired development because of their inflexibility.

There are several types of zoning that appear to be effective as regulatory techniques: (1) planned unit development views the development as a unit rather than as a group of parts - it encourages mixed land use by grouping buildings on a specified minimum area; (2) conservation districts protect environmentally hazardous areas such as flood plains, steep slopes and wetlands; and (3) agricultural districts protect agricultural lands from undesirable development.

Taxes sometimes serve as economic development controls. Most states now have taxes that were originally passed with the intent of controlling land-use patterns. Though they have a variety of names - greenbelt, use-value, open space and differential taxation - all of these types of property taxes embrace the idea that land on the urban fringe can be protected from more intensive development by giving the landowners a tax break. The tax break is in the form of a subsidy in which the tax on land is based on current use rather than market value. Since most of these laws are relatively new, research findings on use-value tax laws are inconclusive, but preliminary findings suggest that they are inadequate to preserve open space. Income taxes probably have a greater impact on land use than property taxes. The impact comes from the method used to tax capital gains as well as from the deductions allowed for interest and property taxes for individual income taxes.

Another means of influencing economic development is by the location, type, and timing of public investments for capital improvements. The construction of roads, water, sewer, and power lines has a direct effect on land uses and values since economic development usually flows more readily into areas where basic public facilities are already available. Comprehensive planning for overall growth and development must include public investment in capital stock as a strategy in guiding the direction of economic development.

In this attempt to identify strategies to control economic development, the discussion has touched on several broad areas, some more deeply than others. There may well be other strategies that might be useful in the efforts of communities to manage growth or decline in the 1980s.

Scenarios

Before we actually start our scenarios, we need to list some conditions that will exist in each of them.

1. In each case, the communities will be limited in their resources, especially monetary resources.

2. Management of growth or decline will take place against the backdrop of an economy undergoing some basic changes.

3. Management of growth or decline will take place against the backdrop of significant demographic changes, i.e., smaller, more fragmented families (households) and a population with a heavy concentration of people in early middle age (35-45).

4. Demand for housing will be on the upturn when construction of single and multi-family housing is one the downturn due to high interest rates.

5. Communities will be forced to seek help from the private sector for joint private/public projects.

Scenario 1

The community is a small city in Florida with a high percentage of elderly retirees in its population. Certain problems and/or needs are readily brought to mind by this description.

First of all, most of those retired people will be on fixed incomes which would limit their ability to pay property, and income taxes, etc. This means that the community is limited in how much it could raise through various kinds of local taxes in order to generate additional revenues.

Secondly, though as a group elderly people can least afford to pay for public services through taxes, they are one of the most service-intensive groups (along with school-age children) in a society. They need public transportation, good medical facilities; i.e., public hospitals and clinics; recreational facilities; i.e., parks, activity programs, etc.; and reasonably priced housing such as public low-cost housing programs.

In the past, the Federal government has absorbed much of the cost of providing public services for the elderly through a variety of programs, but now many of these programs are falling victim to budget cuts.

The following questions need answers:

1. How can the community help its elderly to cope with reduced income and/or other types of assistance?

2. How can the community help itself to determine the service needs of its population and then find ways to help meet those needs?

3. Are there ways for the private and public sectors to cooperate to help maintain the public services needed by the community? If so, what are they?

Scenario 2

The scene is a small town in the Mississippi Delta with a predominantly black population which is largely dependent on agriculture for its livelihood. The following problems or needs are readily apparent.

The agricultural sector is in a near-depression economic state. Bad weather, high interest rates, grain embargoes, etc. have combined to make the last few years difficult ones for farmers. In fact, many small to middle-sized farm operations are being liquidated because the farmers have exhausted their resources and can't hold on any longer. Businesses tied to farming such as farm machinery dealerships and feed and fertilizer businesses are suffering too. With farmers going out of business or reducing their operations, they will be laying off the laborers from their farming operations.

Federal budget cuts have reduced the amount of assistance available to both the farmer, his workers and related businesses. People who have little or no income cannot pay property taxes and income taxes. Yet there is still a need for public services such as police and fire protection, schools and roads.

The following questions need answers:

1. What are some possible strategies for coping with the decline of this small Delta town?
2. How can the community identify and capitalize on its strengths in order to turn its economy around?
3. How can public services be maintained in the meantime?
4. What are the services that are most necessary for maintaining normalcy in the community?

Scenario 3

The scene is a suburban community on the edge of a large city in the Southwest. The economy of the city is based largely on defense-related and natural resource industries. The recession has had a minimal effect on the economy of the city and the outlying districts. The following problem and/or needs are associated with the community.

The pressure for economic development is growing. The majority of the population favors economic development - the more, the better and right now. Community planners are aware of the fact that the community has good schools, above average roads and streets, good water and sewage systems - in other words, all the advantages.

This community is at a crossroads. Its community decision-makers can elect to allow economic development to occur in a haphazard, unplanned fashion, or they can put the brakes on and ask themselves and other interested groups some of these questions.

1. What do we want our community to be like in twenty years?

2. How can we control growth in order to improve the chances of achieving our community's goals?

3. More specifically, how can we determine what types of development are best suited for our community both economically and socially?

4. Will these types of development sufficiently increase the tax base to allow a positive return on the public investment for services?

Scenario 4

The scene is a Southern city of approximately a half million population with a mixed economic base - some light industry, a university and medical center, various commercial enterprises (non-basic), and a state capital. The city is encountering a wave of problems associated with urban economic development - demands for better policy and fire protection, better streets, and highways, more public recreational facilities, and expansion of water, sewer and power lines into outlying districts. The problems of urban sprawl are here. Another familiar story is that the population is moving further out beyond the urban fringe to the "quiet rural life," and as this shift occurs, the tax base of the inner city continues to shrink. The tax base is shrinking, but the demands for services by the population remaining within the inner city are growing. City planners are "on the horns of a dilemma." They must decide on an overall plan for the future development of the city. The following questions need to be answered.

1. In what direction is our city moving economically?

2. Are we satisfied with that direction?

3. What types of economic development would be most advantageous to our city now and in twenty years?

4. What strategies can we use to guide growth and/or decline that will most likely result in the desired community objectives?

5. How can we determine what services are most desired and needed by the population today? Will they be needed in twenty years?

6. What are the most fiscally sound ways of financing those services given the economic condition of the community today?

Scenario 5

The scene is a small city located on the Gulf Coast which is dependent on both tourism and commercial fishing as its principal basic industries. Though the income from the commercial fishing industry is holding up fairly well, the tourism industry has noticed a significant downturn due to the recession. Though an economic recovery is projected later in the year, it promises to be a weak recovery with little relief in sight for the ailing tourist industry.

City planners know that they must find answers to some hard questions.

1. Is our city moving into a projected decline?

2. If so, are there other types of economic development that would fit in well in our community environment, and what can the community do to encourage appropriate development?

3. At the same time, what public services can be reduced in response to limited resources?

4. What goals or objectives do our people want to pursue as a community?

ECONOMIC-DEMOGRAPHIC IMPACT ASSESSMENT MODELS: CHARACTERISTICS AND CONSIDERATIONS IN ADAPTATION AND DEVELOPMENT

Steve H. Murdock
Texas A&M University

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North Dakota State University

Lonnie L. Jones
Texas A&M University

Economic-demographic projection models are receiving increasing attention as a means of analyzing the economic, demographic, public service and fiscal impacts of resource and industrial developments (Murdock and Leistritz, 1980) and as means for producing basic economic and demographic forecasts for rural and urban areas (American Statistical Association, 1977). There is little doubt that the ease of use, flexibility, quick turnaround and the large number of outputs provided by such models will make them of continuing importance to planners, extension personnel, researchers and others who must plan for the long-term needs of communities and counties. At the same time, the large number of such models, their increasing complexity and the increasing body of relatively fugitive literature on such models (Leistritz and Murdock, 1981) makes it difficult for even the most experienced modeler to keep abreast of the changes in modeling methodologies, to evaluate the major areas of similarity in such models, or to identify the key factors that should be considered in adapting or developing such models.

The purpose of this paper is to provide a partial overview of economic-demographic impact modeling procedures, to describe their major characteristics, and to suggest factors that should be examined by any user who is considering adapting or developing such a model. Specifically, we present a brief history of such models as a means of describing the context of development of such models, examine criteria for evaluating such models, provide an evaluation of several of the most widely used models, and discuss key factors that should be considered in the adaptation and development of such models. The paper thus attempts to provide an introduction to the features and characteristics of economic-demographic models, to overview the state-of-the-art of impact modeling, and to provide some practical guidance for those who may be considering adapting or developing such models.

Historical Background of Computerized Models

The basic techniques for economic and demographic impact assessment have been developed and refined over a considerable period, while

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public service and fiscal impact analyses have a shorter but still substantial history. During the decade of the 1960s, however, there was growing recognition of the interdependence of various factors and, hence, an increasing interest in finding ways of taking such interdependencies into account. During the same period, the capability for developing more complex models which would integrate multiple dimensions was greatly enhanced by the increasing power and availability of electronic computers. Early work emphasized both developing more complete, detailed models for single dimensions (e.g., economic, demographic) and attempting to integrate various dimensions (e.g., economic activity and population, population and land use). By the end of the decade, some attention had been given both to the integration of economic and demographic factors and to the application of integrated economic-demographic models in rural areas.

One regional economic-demographic model which was developed during the late 1960s had a substantial influence on subsequent socioeconomic modeling efforts. The Susquehanna River Basin Model differed from most earlier models in that it provided for a specific linkage of the economic and demographic sectors and that it included nonmetropolitan areas, whereas previous models had generally focused only on a single large city (Hamilton, et al., 1969). The model made extensive use of feedback loops to link its various components, a structure which was inspired at least in part by the earlier work of Forrester (1961).

The research group at Battelle Columbus Laboratories who developed the Susquehanna Model subsequently constructed similar models for the City of San Diego (San Diego Comprehensive Planning Organization, 1972) and for the State of Arizona (Battelle Columbus Laboratories, 1973). The Susquehanna Model also influenced the structure of a regional forecasting model developed by the Tennessee Valley Authority (Bohm and Lord, 1972). These models, in turn, influenced subsequent model development efforts (see Figure 1). Notable among these were the series of economic-demographic models developed by the states of Arizona and Utah (Bigler, Reeve and Weaver, 1972; Anderson, et al., 1974) and the MULTI-REGION Model developed at Oak Ridge National Laboratory (Olsen, et al., 1977).

These models all provided for linkages of the economic and demographic sectors through a submodel which simulated the operation of the labor market and provided for in- or out-migration from the study area in response to changes in labor market conditions (i.e., if the demand for labor increased more rapidly than the "natural increase" in labor supply, in-migration would occur). The models differ somewhat in the degree of sectoral disaggregation within the economic module, however. For example, while the Susquehanna Model utilized only three employment categories, the ATOM-3 Model included 88 employment sectors. The models also differ in the degree of spatial detail of their outputs with some providing employment and population projections at the county level (e.g., ATOM, UPED, CPE) and others providing projections only at the multicounty regional level (e.g., Susquehanna, MULTIREGION). Finally, these models differ significantly in the time increments associated with their projections. While a few models provide projections annually (e.g., ATOM-3), several produce estimates only at five-year intervals (e.g., UPED, MULTIREGION).

Socioeconomic projection models developed during the late 1960s and early 1970s were employed primarily as tools for state and regional economic planning. As interest in evaluating community-specific impacts of major projects grew, however, these models were found to have substantial limitations as impact assessment tools. The two principal limitations were a failure to include a number of significant impact dimensions, particularly public service requirements and fiscal impacts, and insufficient spatial and temporal disaggregation of outputs. Thus, in the mid-1970s attention turned to developing models which incorporated additional impact dimensions and provided outputs at county and subcounty levels. A number of models were developed to meet these needs, including the RED-1 and RED-2 models (Hertsgaard, et al., 1978); the TAMS Model (Murdock, et al., 1979); the BREAM Model (Mountain West Research, 1978); the BOOM Model (Ford, 1976); the SEAM Model (Stenehjem, 1978); the WEST Model (Denver Research Institute, 1979); and the SIMPACT Model (Huston, 1979).

(Figure 1 Here)

These "second-generation" models differ from the earlier economic-demographic projection models primarily in the number of impact categories included and in the degree of spatial and temporal disaggregation of their outputs. Thus, several of these models address public service requirements and public sector cost and revenue effects as well as economic and demographic impacts (e.g., RED, WEST, SIMPACT); some provide projections of individual cities, school districts, or other subcounty areas as well as for counties and regions (e.g., BREAM. RED, WEST); and most provide yearly projections of key impact indicators.

Criteria For Model Evaluation

Although the needs, and thus the criteria, for evaluating models are likely to vary for particular circumstances and decision makers, several general considerations must enter into the process of model selection in virtually all circumstances. These criteria should include consideration of:

(1) information requirements
(2) methodological forms and validation
(3) use characteristics

Each of these factors is discussed briefly below.

Information Requirements

Clearly, the starting point in selecting a modeling system is the information needs of the user--what information is needed, for where, and for what periods of time. Environmental impact assessments and community planning are requiring an increasingly larger volume of socio-economic data. These data usually include, at a minimum, information on the economic, demographic, public service and social changes likely to occur under both baseline and impact conditions, and for both construction and operational phases during impact periods (Council on Environmental Quality, 1978).

The economic data usually include information on changes in income, employment and business activity, and changes by type of industry. Information on demographic changes usually includes data on population increases and, increasingly, information for particular age, ethnic and other groups, and for small geographic units such as municipalities as well as total impact areas. Public service data tend to concentrate on the number of new service facilities and personnel required to serve new in-migrating populations, on the costs of such increased services, and on the public revenues likely to be generated by new populations. Social changes are usually measured by data on a population's perceptions of developments, goals for its community, community satisfaction and expected changes in social structures. Because the costs of acquisition of single data sets (social, economic, etc.) are likely to require investments that may exceed those for an entire modeling effort, the inclusiveness or lack of inclusiveness of a model may be particularly significant. Those models that provide larger proportions of the necessary data items are thus clearly of greater utility.

Equally important is the need to ascertain both the levels of geographic output provided by the model and its ability to provide outputs for alternative time periods. Many of the available models provide output only at the total impact area level or for counties, but not for individual cities or other government districts. As a result, such models, though useful for those involved in regional planning and decision making, are likely to be of little use to the decision maker charged with allocating resources or assessing impacts for school districts or other local units of government.

At the same time, it is essential to ensure that results are provided for the necessary time periods. That is, impact periods, particularly construction periods, often show rapid changes from year to year, and these changes often require careful planning and resource allocation. However, if such models provide results for only five-year periods rather than for yearly periods, year-to-year changes will not be detected.

Finally, it is essential that the model provide separate outputs for baseline, construction impact and operational impact periods. Since impact assessment involves comparing impact-induced changes to a projection of baseline changes over time, data for both baseline and impact conditions are essential. Also, since construction and operational phases are separate in impact assessments, and have distinct types of impacts, the production of separate results for each impact phase is essential. In sum, then, the temporal as well as geographical specificity of model outputs should be analyzed.

Methodological Considerations

Although the methodologies employed in various models involve numerous technical distinctions that are not appropriate to our discussion here, several aspects of model methodology should enter into evaluations of alternative models.

First, some methodologies are simply likely to be more adequate than others. Although, under any set of circumstances, several alternative methodologies may be of equal utility, general assumptions can be made about such methodologies. Thus, even a brief examination of information on demographic projection techniques will suggest that techniques using age cohorts are generally superior to those with less detail (Shryock and Siegel, 1973). A short consultation with appropriate experts will generally provide similar information in regard to other model dimensions.

Second, it is essential to evaluate the extent of submodule integration in such models. Most of the existing models involve a major premise that economic and demographic aspects of developments require careful integration. Many, however, make no attempt at effective integration of key components, but rather simply apply separate methodologies (i.e., for economic and demographic projections) to a common set of project characteristics.

Finally, the assumptions underlying the methodologies employed in such models must be evaluated carefully in terms of such dynamic modeling capabilities as:

(1) the ability to incorporate changes in the structure of model relationships over time
(2) the inclusion of the key structural dimensions of the phenomena of interest
(3) the incorporation of feedback loops for updating baseline figures

In general, models that allow the use of multiple rates for various factors during different phases of the projection period (such as changes in labor force participation rates or fertility rates), that utilize factors that most closely differentiate between key dimensions (such as industries or age cohorts), and that incorporate procedures that feedback changes, such as alterations of population age structures or changes in the economic structures, are superior to those lacking such features.

It is, of course, evident that an overriding factor in model selection must be an evaluation of a model's accuracy in predicting impact and baseline conditions. Although most of the existing models have been developed recently and relatively little evidence has accumulated for evaluating their validity, evidence convincing the validity of source module has been accumulated or can be derived by using available data sources. In addition, given samples of the outputs of model projections for various areas, several types of evaluations can be made quite easily. For example, estimates of economic factors such as income at the county level and population levels for counties and incorporated areas are published periodically by the Bureau of Economic Analysis and the Bureau of the Census in the Department of Commerce. These estimates can be compared to those for the various models, and some idea of their accuracy can thus be gained. This approach, which involves a comparison of data from past periods to those projected by a model for such perods, is often termed historical simulation (Pindyck and Rubinfield, 1976). In addition, it is possible to use dynamic simulation techniques and sensitivity analysis (Pindyck and Rubinfield, 1976) to analyze such models. This involves a comparison of the trends shown in the model output for the projected future periods to those noted in impacted areas in the past. Such comparisons provide a valuable and clearly essential step in model analysis and model selection.

Use Characteristics

Additional dimensions that must be considered relate to the use characteristics of such models. Two of these dimensions are the availability and cost of obtaining the input data required for a model's implementation. Many models use input-output economic models that require the use of state or regional input-output interdependence coefficients. These coefficients are avaiable in most areas, but, if an appropriate set of coefficients does not exist, then the implementation of such models is likely to be quite expensive and to require extensive data collection. Similar consideration must be given to other data dimensions.

It is essential to note that models that reduce data collection costs by utilizing national data bases may accentuate problems in projecting local level conditions that depart markedly from national patterns. The tradeoff between the need for locally oriented data inputs and the costs of collecting local data must be evaluated carefully.

The flexibility of use of the model should also be considered. Impact assessments and impact events involve numerous factors that are difficult to evaluate and predict. Thus, it becomes essential to examine the range of potential impacts under widely varying assumptions for such factors. Models that provide easy alterations of such factors and rapid outputs for alternative development scenarios are desirable. In evaluating models, the options provided for altering key assumptions such as the number of projects, the size of the project, the location of the project, inflation rates, birth rates, per capita service usage rates, and other factors should be closely examined.

An additional criterion to be considered is the availability and adaptability of the computerized form of such models. Some models can be accessed only through the agency that implemented the model, while, in other cases, cooperative agreements can be established which provide the model code to a user agency. In general, efficient use of the model is facilitated by the ability to acquire the model code.

In addition, however, it is essential to ensure that appropriate computer facilities and computer compilers are available if the computer code is to be obtained. The incompatibility of different types of hardware and the lack of appropriate language compilers can make adaptability very costly.

Model Comparisons

In this section, we attempt to compare a wide set of models presently employed in socio-economic impact assessment projects in various parts of the United States, in terms of the criteria noted above. The models evaluated include:

(1) ATOM 3 (Beckhelm, et al., 1975)
(2) BOOM 1 (Ford, 1976)
(3) BREAM (Mountain West Research, 1978)
(4) CLIPS (Monts and Bareiss, 1979)
(5) CPEIO (Monarchi and Taylor, 1977)
(6) HARC (Cluett, et al., 1977)
(7) MULTIREGION (Olsen, et al., 1977)
(8) NAVAHO (Reeve, et al., 1976)
(9) NEW MEXICO (Brown and Zink, 1977)
(10) RED (Hertsgaard, et al., 1978; Leistritz, et al., 1978)
(11) SEAM (Stenehjem, 1978)
(12) SIMPACT (Huston)
(13) WEST (Denver Research Institute, 1979)

Although numerous other models are available, this set includes a majority of those which attempt to project the impacts of large-scale resource developments, have published descriptions, and have been widely used by national, regional, and local decision makers (Denver Research Institute, 1979; Markusen, 1978).

The comparison of these models is presented in three tables. Table 1 addresses Criterion 1 and describes the information characteristics of the models. In this table, the dimensions examined by the model, the project phases, the geographical units, and the time periods for which projections are made are shown. Dimensions considered as possible components of such models are: the economic, demographic, interface, distributional, public service, fiscal, and social components.

Table 2 compares the methodological characteristics of the models. These characteristics include the form of methodology used in each of several possible major components of such models, the form of model integration, the dynamic capabilities of each model component, and the extent of validation of each model. In this table, characteristics for the economic, demographic, interface, distributional, service and fiscal components of each model are described.

Table 3 addresses Criteria 3 and provides information on the use characteristics of such models. In particular, it compares the data inputs and the computerization requirements of such models and the extent to which such models allow user input through parameter alteration and the use of interactive programming.

(Tables 1-3 Here)

In comparing the models, we have been limited to the information provided in the reports available for each model. In cases where such reports do not discuss a particular item, the designation, INP-information not provided, is used. Given these limitations it is essential to stress the need for users to conduct careful analyses of models that appear appropriate for their particular information needs.

Although it is impossible to discuss the data in Tables 1-3 in detail, given space limitations, even a brief description of the items in Tables 1-3 indicates how diverse the models are in overall capabilities and characteristics. As is evident from Table 1, only four models (BOOM 1, RED, SEAM, and SIMPACT) contain as many as five dimensions. None addresses social factors, and few contain the potential for such an expansion. All cover the three vital project phases, but areal coverage varies widely. Only five models analyze both county and city impacts. Most do provide yearly outputs, but many are limited in the total number of units that can be included in the model.

In terms of methodological characteristics (Table 2), the differences are less pronounced. Only four systems utilize an input-output model, and all but two use a cohort-component demographic projection technique. Almost all use an interface procedure that involves the matching of available and required employment to determine migration levels. Nearly all are dynamically programmed. None has received adequate validation, but some have been subjected to sensitivity and historical simulation analyses.

The use characteristics (Table 3) show great diversity from one model to another. The RED model requires the greatest amount of primary data, while the SEAM model requires virtually no local data (except for the interface procedure where local data is necessary for non-western areas). All other models tend to be intermediate between these two in data requirements. Only four of the models are interactive, allowing users to alter various parameters; and, of these, the RED model appears to allow the alteration of more parameters than other models. Nearly all of the models are programmed in languages likely to be available at major computer installations. The use of interactive languages (GASP IV, SIMSCRIPT and APL) is likely to decrease the core storage necessary for the use of such models, and thus, models using these languages are likely to be more adaptable to smaller computer systems. On the other hand, at small and medium-size installations, compilers for such languages may not be readily available. Finally, in almost all cases,the adaptability of such models is untested. Although several models (including BREAM) incorporate aspects of the ATOM 3 model, and the BOOM 1 and RED models have been adapted by researchers in Texas (Murdock, et al., 1979; Monts and Bareiss, 1979), the adaptability and transferability of such models remain largely untested.

Overall, then, the comparisons in Tables 1-3 suggest that available socio-economic assessment models are least different in the methodologies employed and most different in the extent of information provided and in use characteristics. Since these latter two factors are the ones central to decisionmakers' concerns, it is clear that careful evaluations of individual models are an essential first step in model selection.

Factors in Model Adaptation and Development

Nearly all of the models described above have been developed for specific areas of the nation. As a result, even if one chooses to use one of these existing models' structures for performing socio-economic projections, its use will require an adaptation effort to adapt it to the specific geographical area of interest and to the unique characteristics (i.e., public revenue and expenditure patterns) of that area. If none of the models are adequate to meet a specific projection need, then the development of a new model may be necessary. As in the selection of existing models, the adaptation or development of a socio-economic model requires the consideration of numerous factors. In this section, steps in and factors affecting model adaptation and development are examined.

Model Adaptation

The processes involved in the adaptation of a modeling system may vary in complexity from simply the alteration of its data base to include data for the area of interest to numerous and substantial changes in its computational structure. Because of the interactive nature of such models' structures, even slight modifications in a model's structural components may lead to such a substantial redesign of the model that the resource and time commitments necessary to complete the adaptation may be little different than those involved in the development of a new model (Murdock, et al., 1980). Whether only slight or major alterations are required, however, it is essential to consider the major steps in, and those factors likely to improve, an adaptation effort.

The adaptation of a socio-economic model may be seen as involving at least five major steps. These steps include the following:

(1) evaluation of computer system compatibility
(2) estimation of necessary changes in model structure
(3) data acquisition
(4) model implementation
(5) model validation

Computer System Compatibility. The computerization of assessment models is, of course, the key to their attractiveness and their utility. The specifics of such computerization, however, may be problematic and should be carefully considered prior to the initiation of an adaptation effort. They should, in fact, be as carefully considered in the choice of a model for adaptation as its conceptual or computational bases.

The availability of the model's computer language, the work space capacity provided at the computer facility where the model is to be installed, and the availability of programmers with the desired language skills must be carefully considered. Although the evaluation of these factors may appear too obvious to merit discussion, the tendency to take the existence of such factors for granted often leads to significant difficulties and time delays. For example, if language and operating system capabilities differ between the initial development system and the adaptation system, one may be forced to manually key the computer model code into the system and convert incompatible symbols from one version of a language to another.

Other difficulties are often encountered because of differences between the environment where the initial model development was performed and that where it is to be adapted. Differences in core availability and in the number of work spaces available for use may require months of negotiation with facility officials and extensive restructuring of a model. In adapting a complex computerized model, then, careful consideration must be given to computer compatibility in specific and detailed terms.

Model Structure. In the adaptation of a model's structure, the most important considerations should be the extent of congruence between the structure of the model and the local environment to which the model is to be adapted. The evaluation of such congruence is central in the consideration of each major model component.

In the economic module, for example, it is clear that the economic sectors used must be sufficiently detailed to adequately characterize the impact area environment. An evaluation of the level of detail necessary to properly characterize the economy of the area to which the model is to be adapted is thus essential.

The adaptation of the demographic module of an assessment model usually involves relatively few difficulties because such components are widely available, and substantial experience has been gained in their use. However, if "special population" procedures are required, then substantial revisions in the module structure may be necessary. That is, if information for specialized populations such as Native Americans, Blacks or other groups is necessary, then substantial revisions in a model's structure may be necessary. An evaluation of the ramifications of such changes, of the data required to implement such changes, and of the compromises between the detail desired in outputs and module structure capabilities must be made.

Interface modules often receive relatively little alteration in adaptations to other settings, but the congruence of their design with the adaptation environment should be carefully considered. For example, those demographic characteristics often used to estimate population from data on the number of in- or out-migrating workers must be carefully evaluated to determine their applicability to the area to which the model is to be adapted.

The adaptation of allocation modules involves factors similar to those that must be considered in the adaptation of interface modules. That is, although no extensive changes are usually necessary in the computational procedures of such modules, it is usually essential that data on such factors as worker commuting patterns be obtained to evaluate the accuracy of the assumptions being used in this module. Service modules also seldom require major changes. The only major change required is likely to be the substitution of local population-based rates for those initially included in the module.

The fiscal module usually receives the most extensive alterations. Tax structures are significantly different from one state to another. Thus, some states have severance taxes or other resource-use taxes or in-state income taxes while others have neither. Although the basic structure of the fiscal module of the initial model may be useful, the reprogramming involved in the adaptation of the fiscal component is usually extensive. In general, the adaptation of fiscal components of such models is not likely to be as beneficial as that of other model components.

In general, then, alterations in several model components are required due to differences in the initial adaptation area environments. Although the existence of a model structure for adaptation usually serves several purposes and saves countless hours of original programming, major alterations in the model's structure are usually required. The major advantage of using an existent model structure, in fact, appears to lie less in the availability of a physically manipulable computer code than in the conceptual design that it provides for evaluation and reconsideration.

Data Acquisition. The difficulty of obtaining the data necessary to adapt a model to a different environment varies greatly depending on the data item required. The acquisition of demographic data offers few difficulties because of the centralized sources for such data. For fiscal data, secondary data sources may also be used, although local level data may be desirable in some circumstances. Economic data are more difficult to obtain, especially for a relatively complex economy. If a state input-output model is to be used, for example, aggregation and regionalization of coefficients may be necessary. Other major areas of difficulty in obtaining data for the economic module occur in the collection of data on workers and for project expenditures. Public service data are usually the most difficult to collect and require extensive site-area data collection.

In evaluating the feasibility of an adaptation effort, careful consideration should thus be given to the question of data availability and the implications of failing to obtain specific data items. If a model is data intensive, the data values in the initial model do not accurately reflect conditions in the area to which the model is to be adapted, and such data are unlikely to be available, then a less data-intensive modeling scheme should be considered. On the other hand, if data are unavailable but the model values appear applicable to the adaptation area, then an adaptation effort may, in fact, yield an applicable model that could not otherwise have been developed from available data sources. Before an adaptation effort is initiated, then, it is essential to evaluate the importance and potential availability of all data items and to assess the limitations and the potential of the model in addressing such limitations for the adaptation area.

Model Implementation. Model implementation refers to those activities involved in the computerization of the conceptual structure of the model. Although such considerations are clearly dependent on system compatibility, the factors to be discussed here relate to the processes rather than to the structural characteristics involved in establishing a computerized modeling system. As a result, they require separate discussion.

In implementing an adapted version of a model, several considerations must be taken into account. Foremost among these considerations is simply the need to become fully acquainted with the model's computational procedures and the patterns of interaction between model components. The level of familiarity required is not only an overall familiarity with what the model is to do conceptually, but an exact knowledge of the computational structure of each step in the model. (One must obtain the same level of familiarity with the model that one would have obtained if he or she had programmed the original model.) Although this requirement may seem obvious, it is quite tempting, given existing computer code, to avoid a detailed analysis of the model's computer code assuming that the model must certainly take various contingencies into account. For example, whether the model code for an item aggregates subunit totals to obtain larger area totals or allocates from a larger area to subunits, or whether units are in hundreds, thousands, etc., may seem relatively inconsequential, but such knowledge is vitally important, particularly when alterations in the model code must be made.

In many cases, in fact, the highly interactive nature of such models may place extensive demands on the computer analyst. The ramifications of changes in the model code must be traced throughout the model. If a concise and powerful computer language, such as APL, is used, this is especially important. If the implications of a given change are not adequately evaluated, difficulties will inevitably occur at some other phase of the modeling project. The major point is thus the obvious one--computer expertise is as essential in adapting a model as in the initial development of one.

Model Validation. Efforts to validate a complex socio-economic assessment model are difficult under any circumstances. With an adapted model the process is, in some ways, actually made more difficult. The difficulties arise because of the need to take differences in the development and adaptation contexts into account. Careful analyses must be performed to determine whether differences between the results obtained from an adapted model and the original model are due to contextual differences between the adaptation area and the original model development site-area, such as differences in the density of settlement in the two areas, or are a result of computational or model design errors. The outputs of an existing model can serve as a basis for comparison for those from the adapted model, leading one to find errors that would not have been detected otherwise. In validating an adapted model, the original model's results should serve as the basis of one's expectations for the adapted model's results. Until deviations in the nature of the results from the original model can be explained computationally, as well as conceptually, major changes in model structure should not be made.

These five steps, then, are those usually necessary in a model adaptation effort. The careful performance of each of these steps and the careful consideration of alternatives and problems likely to occur in each step are essential for an effective model adaptation effort.

General Considerations in Model Adaptation

The successful completion of the model adaptation steps described above requires consideration of numerous factors and conditions related to the models involved and the adaptation context. In this regard, although no comprehensive list of considerations can be given, at least four factors appear to us to be essential in any model adaptation effort. The following factors are essential to any model adaptation effort:

(1) careful preliminary model evaluation
(2) use of an interdisciplinary adaptation team
(3) a structured organizational environment
(4) extensive user input and involvement

Each of these factors is discussed briefly below.

Preliminary Model Evaluation. One essential consideration is that entailed in the preliminary process of evaluating a model for possible adaptation. Although all of the difficulties that may be encountered in an adaptation effort cannot be anticipated, in many cases, preliminary evaluations of models being considered for adaptation can eliminate many potential problems. It is particularly important not only to evaluate the probability that one can estimate a given parameter or obtain a given data item but also to examine the implications of being unable to obtain a given estimate or parameter value. One significant missing data item or a procedure that is inappropriate to the adaptation context may make it necessary to reappraise the use of a given model. In nearly all cases, the time spent in evaluating a model will not be wasted if a model is later chosen for adaptation. The effort expended in evaluating data sources and alternative estimation techniques is likely to expedite the adaptation effort once it is initiated.

Use of An Interdisciplinary Adaptation Team. A second factor central to the evaluation and the adaptation effort is the use of a truly interdisciplinary adaptation team. In the case of models such as those described above, a model adaptation team may entail a computer systems analyst, an economist, a demographer, a public service analyst, and a fiscal impact analyst. Although a given member of the adaptation team may be familiar with the conceptual as well as the methodological bases for more than one of the major components of a model, it is unlikely that a model can be properly adapted by persons from any single discipline. Thus, although an economist or a demographer may be capable of doing many types of analyses, neither's skills can substitute for those of the systems analyst. In addition, it is important that members of the modeling team interact as openly and as equitably as possible. Each discipline's point of view must be forcefully presented and integrated with the perspectives of other disciplines.

Structured Organizational Environment. A model adaptation effort also requires the use of a relatively structured organizational environment. That is, the organizational structure must be such that decisions concerning necessary compromises between the ideal conceptual design, the most efficient computer systems design, or the most desirable economic, demographic or other estimation procedure can be made. In some cases, these compromises cannot be made on a consensual basis, and a structured, decisionmaking environment is thus essential. In addition, such essential tasks as the determination of schedules for the completion of model subcomponents and the coordination of diverse modeling tasks often require a more structured organizational environment.

Extensive User Input and Involvement. A fourth factor which is essential for an effective model adaptation effort is the inclusion of potential model users in the adaptation team. An advisory group selected from public agencies and industry can serve a number of functions including the provision of necessary data items for model completion, the review of model adaptations, and the evaluation of preliminary model results. Such advisory groups seem desirable whenever a policy-oriented model development or adaptation effort is to be undertaken.

In sum, a model adaptation effort requires the performance of a number of carefully executed steps. These steps are most effectively

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performed by an interdisciplinary team of researchers representing various disciplines and potential model users. An adaptation effort will often require the establishment of a relatively structured organizational environment, but it must be in which open discussion between potential users and scientists from various disciplines can take place. An adaptation effort, then, is often demanding and should be undertaken only after careful evaluation of the time and personnel resources necessary to complete the task.

Model Development

the decision to initiate the development of a new model rather than adapt an existing one involves an extensive commitment of time and personnel resources. The expenses entailed in such a development and the increasing availability of already developed models, such as those described above, may result in a decreasing number of new model developments in the coming years. Some new developments seem likely, however, as the increasing complexity of interactions between socio-economic factors are further delineated and socio-economic conditions are more effectively linked with other impact dimensions (Leistritz and Murdock, 1981). As with model adaptations, it is essential to consider some of the key steps in the development process and some of the major factors essential to the success of a development effort.

The steps in the model development process are similar to those for the adaptation process and thus their discussion can be relatively brief. At the same time, as with the discussion of such steps in the adaptation process, it should be recognized that the number of steps delineated is relatively arbitrary and that additional steps could be presented.

Among the key steps in the model development process are the following:

(1) the formation of a model design-implementation and user development team
(2) the determination of data users' informational needs
(3) the delineation of the areal, temporal and content coverage of the model
(4) the determination of the model's conceptual structure
(5) the determination of the desired system design characteristics of the model
(6) model implementation
(7) model validation

These steps are discussed briefly below.

The first three steps reflect the need to use a multidisciplinary model development team and to include data users in the development effort. Although this need has already been addressed in the discussion of model adaptation, it is essential to emphasize that such a team is of even greater importance in a model development effort when key decisions about model design have yet to be made. A model is more likely to be used if its potential users have been involved in its design such that the outputs it is designed to produce meet the informational needs of its users for the areas and time periods with which they are most concerned. Although care must be taken to ensure that a wide range of users' needs, not just the needs of users directly involved in the model development effort, are anticipated and that the integrity of the model design effort is maintained, models whose development efforts do not involve users are likely to be less widely utilized than those which include user input (Leistritz, et al., 1978). Especially critical to this utilization is the completion of small area projections for baseline and impact periods and for time periods of short duration. Models that provide only regional projections or projections for every fifth year rather than every year, for example, may fail to address users' data needs, particularly during project construction periods. Finally, in nearly all cases, such a design effort must involve an interdisciplinary team, for only such a team is capable of designing a model that can address the wide range of user needs that must be addressed by such efforts.

The determination of a model's conceptual design is the most purely academic step in the model development effort. It involves standard methododological considerations related to the evaluation of the most desirable and feasible techniques given cost and data constraints and the relative validity and reliability of alternative methods. Of particular concern in this step is the design of feedback and interface linkages between model components and the inclusion of a wide range of model components. Most models lack critical linkages between such components as the public service and economic components (i.e., they do not trace the effects of public service conditions on changes in business activity) (Leistritz and Murdock, 1981), and none contains a developed social (as distinct from demographic or public service) component. The need for further refinement of the conceptual bases of such models often becomes all too clear during this development phase.

The desirable system design characteristics for such a model have been examined in the discussion of existing models and require little additional evaluation here. It remains essential to note, however, that if ease of model adaptability is a secondary goal of the initial development effort, care must be taken to use a design that employs a generally available language code and that requires limited core storage capacity.

The content of a model's implementation and validation steps are relatively unique to a given model structure and cannot be easily generalized for discussion here. It is necessary to note, however, that it is best to accompany each step of implementation with a systematic validation analysis. Once the total design of a model has been completed, error diagnoses can be extremely difficult. Historical simulations as well as sensitivity analysis should be performed and their results compared to known patterns and trends. In all cases, validation analyses are absolutely essential to the completion of a development effort.

The steps in model development, as in model adaptation, require careful planning and completion. They require a concerted and relatively long-term effort if the model's development is to be successful. In addition, the success of such efforts is likely to be dependent on the existence of a number of conditions within the modeling development environment.

General Considerations in Model Development

Many of the factors most likely to ensure the success of a model development effort have already been discussed. Because of their critical importance in model development efforts, however, they are again briefly summarized below.

These factors include:

1. Early involvement of potential information users--As already noted, the participation of potential users in the model design effort not only improves the chances that the resulting models will be compatible with their needs but also can provide the developers with easier access to local data bases. User involvement through the development period allows for correction of initial model inaccuracies based on information about local conditions. Furthermore, the meaningful involvement of users in the development process increases the likelihood that they will use the assessment model.

2. Appropriate timing with respect to information needs--Awareness of upcoming decisions and the need for the information the model can provide and timely provision of information to meet those needs are also essential. If modeling efforts are pursued before decision makers feel the need for the information they can provide or if the development process is so extended that the important issues have been addressed prior to the model's completion, the effort is unlikely to be highly utilized or well received.

3. Knowledge of study area conditions--Socio-economic impact analysis requires a detailed understanding of the economic, demographic, public service, fiscal, and social conditions of the study area. If the researchers do not possess such knowledge, they must be willing to make a significant effort to gain a thorough understanding of local conditions and relationships.

4. Knowledge of impact assessment techniques--Socio-economic impact analysis generally and impact modeling in particular require a variety of skills, including thorough knowledge of economic, demographic, public service, and fiscal impact assessment methods and expertise in computer systems/programming. Because it would be highly unlikely to find

this combination of skills in one individual, a multidisciplinary team must usually be assembled. Further, if such a team is to function effectively, attention must be given to developing an adequate project management structure.

5. Continuity of professional and technical support--Once the model's structure has been completed, there is a continuing need for competent analysts both to assist users in various applications and to update various data bases and coefficients. There is also a continuing need for advice from persons with expertise in the use and interpretation of assessments in determining when use of a method is appropriate and in interpreting its outputs. In addition, as the model is applied to a variety of problems, needs for refinement are often identified. Determination of the institutional setting (e.g., mission, agency, research institute, etc.) which can best provide a continuity of support will be important to the long-term usefulness of any model.

6. Resources commensurate to the task--Model development, like other research and development endeavors, is not inexpensive. For example, it is estimated that more than $2 million have been invested in development of the SIMPACT computerized assessment system (Huston, 1979). Development of some other regional impact modeling systems has involved costs of several hundred thousand dollars, not including background data collection and analysis. The cost of a development effort must be realistically assessed and adequate resources allocated. Thus such efforts inevitably involve a somewhat speculative and often substantial investment that must be made with a full realization of the potential and the risks involved in such an investment.

Although no single set of conditions can ensure that a model development effort will be successful, the presence of the conditions noted above are likely to increase the probability of success.

Summary and Conclusions

Rapid growth resulting from large-scale development projects has created growing interest in developing integrated socio-economic assessment models. A number of such models have been developed, and they appear to have considerable potential for providing information useful to social scientists and decision makers. These systems are more useful, however, if their capabilities, limitations, and the factors necessary for their adaptation and development are understood. Like other methodological systems, they may most appropriately be regarded as sophisticated calculating mechanisms which may best serve to sensitize the analyst and the decision maker to the implications of alternative courses of action. Even when properly designed, these systems provide only an efficient mechanism for organizing our assumptions and for projecting the implications of these assumptions into the future. No matter how sophisticated their design, these models cannot provide certainty in an uncertain decision environment. Neither can they be expected to resolve scientific or policy differences which are basically philosophical in nature. Finally, they cannot and should not be expected to replace the decision-maker's role of considering all available information and applying judgment in arriving at a final decision.

Whatever their limitations, however, it is clear that as an aid in impact projection and policy analysis, socio-economic assessment models are of considerable utility. Their refinement, expansion, and evaluation must remain a priority area for social scientists who wish to play an important role in the assessment of the socio-economic impacts of major resource developments and in the policy processes involved in planning for and mitigating such impacts.

NOTES

[1] Parts of this paper are derived from two earlier works by Leistritz and Murdock: "Selecting Socioeconomic Assessment Models: A Discussion of Criteria and Selected Models," Journal of Environmental Management 10 (1980):241-252, and The Socioeconomic Impact of Resource Development: Methods for Assessment, Boulder, Colorado: Westview Press, 1981.

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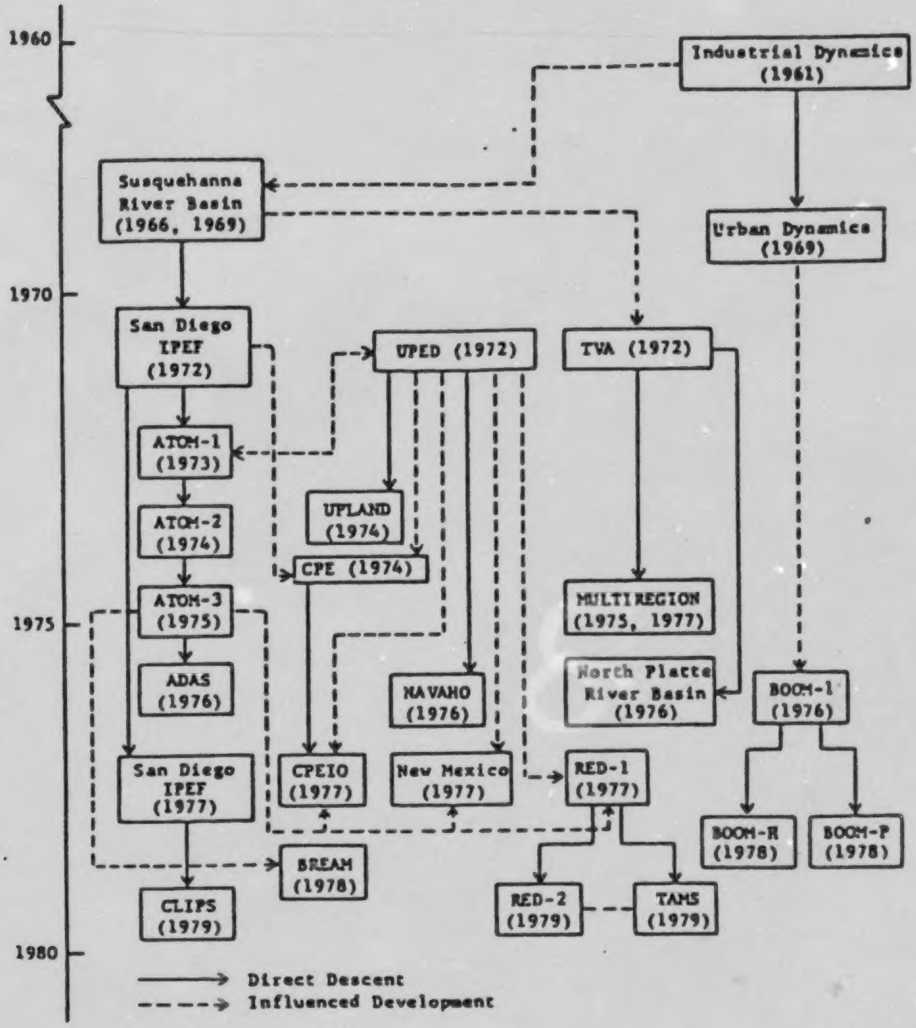
Figure 1. Partial Genealogy of Socioeconomic Impact Assessment Models, 1960-1979


1960
1970
1975
1980
Industrial Dynamics (1961)
Susquehanna River Basin (1966, 1969)
Urban Dynamics (1969)
San Diego IPEF (1972)
UPED (1972)
TVA (1972)
ATOM-1 (1973)
ATOM-2 (1974)
UPLAND (1974)
CPE (1974)
ATOM-3 (1975)
MULTIREGION (1975, 1977)
ADAS (1976)
NAVAHO (1976)
North Platte River Basin (1976)
BOOM-1 (1976)
San Diego IPEF (1977)
CPEIO (1977)
New Mexico (1977)
RED-1 (1977)
BOOM-H (1978)
BOOM-P (1978)
BREAM (1978)
CLIPS (1979)
RED-2 (1979)
TAMS (1979)
Direct Descent
Influenced Development

Source: Leistritz and Murdock 1981

Table 1. INFORMATIONAL CHARACTERISTICS OF SELECTED SOCIOECONOMIC IMPACT ASSESSMENT MODELS

Model	Dimensions Included: Economic	Demographic	Interface	Distribution	Public Services	Fiscal	Social	Project Phases Analyzed: Baseline	Construction	Operational	Geographic Areas Included	Time Increments and Total Projection Periods	Total Number of Areal Units
ATOM-3	X	X[1]	X					X	X	X	State and County	Yearly; NLS	14 counties in Arizona
BOOM-1	X	X	X		X	X[2]		X	X	X	City only	Yearly; NLS	Any given city
BREAM	X	X	X	X				X	X	X	Region, County Cities	Yearly; NLS	2 counties maximum
CLIPS	X	X	X	X		X[3]		X	X	X	Region, County Cities	Yearly; 20 years	INP
CPEIO	X	X	X		X[4]			X	X	X	Restricted to one area, any level	Yearly OAD; NLS	One areal unit
HARC	X	X[1]	X	X	X			X	X	X	Project and County	Five Year; 30 years	INP
MULTIREGION	X	X	X	X				X	X	X	BEA Regional	Five Year; NLS	ALL BEA Regions
NAVAHO	X	X	X	X				X	X	X	Reservation Districts	Five Year; NLS	9 Reservation Districts
NEW MEXICO	X	X	X					X	X	X	State Planning Regions	Five Year; 20 years	7 State Planning Regions
RED	X	X	X	X	X	X		X	X	X	State, Region, County, Cities	Yearly-OAD; 25 years	8 Regions, 53 counties; 350 cities
SEAM	X	X	X	X	X	X[3]		X	X	X	County, Cities	Yearly; 30 years	INP
SIMPACT	X	X	X	X	X	X		X	X	X	Region, County, Cities	Yearly; construction, 10 years operation	Region and 11 subareas
WEST	X	X		X	X[4]	X		X	X	X	Region, County Cities	Yearly; NLS	INP

Abbreviations for items

NLS = No Limit Specified
OAD = Or As Desired
INP = Information Not Provided

[1] Demographic Model includes special population submodules
[2] Costs are aggregated
[3] Revenues are not calculated
[4] Only two services projected

(Derived from Leistritz and Murdock, 1981)

Table 2. METHODOLOGICAL CHARACTERISTICS OF SELECTED SOCIOECONOMIC IMPACT ASSESSMENT MODELS

	Methodological and Integrative Forms by Component						Dynamic Capabilities by Component						
Model	Econ	Dem	Interface	Subarea Distribution	Service	Fiscal	Econ	Dem	Interface	Subarea Distribution	Service	Fiscal	Validation
ATOM-3	I-O	CC-S	E-M-1	% Share	NA	NA	Yes	Yes	Yes	Yes	NA	NA	Historical
BOOM-1	E-B	E-P	E-P-1	NA	P-B	Per Capita	Yes	Yes	Yes	NA	NA	NA	Sensitivity
BREAM	E-B	CC-S	E-M-1	% Share and Gravity	P-B	NA	Yes	Yes	Yes	Yes	NA	NA	INP
CLIPS	E-B	CC-S[1]	E-M-1	% Share and Gravity	NA	Per Capita	Yes	Yes	Yes	Yes	NA	Yes	INP
CPEIO	I-O	CC-S	E-M-1	NA	NA	NA	Yes	Yes	Yes	NA	NA	NA	Some, Forms Unspecified
HARC	E-B	CC-S	E-M-1	Gravity	P-B	NA	Yes	Yes	Yes	Yes	Yes	NA	Sensitivity
MULTIREGION	E-B	CC-S	E-M-1	NA	NA	NA	Yes	Yes	Yes	NA	NA	NA	Historical
NAVAHO	E-B	CC-S	E-M-M	Gravity	NA	NA	Yes	Yes	Yes	Yes	NA	NA	INP
NEW MEXICO	I-O	CC-S	E-M-M	NA	NA	NA	Yes	Yes	Yes	NA	NA	NA	INP
RED	I-O	CC-S	E-M-M	% Share and Gravity	P-B	Per Capita	Yes	Yes	Yes	Yes	Yes	Yes	Sensitivity/ Historical
SEAM	E-B	CC-S	E-M-M	LP	P-B	Per Capita Facility	Yes	Yes	Yes	Yes	Yes	Yes	Sensitivity/ Historical
SIMPACT	I-O	E-P	E-P-1	% Share	P-B	Per Capita Facility	Yes	Yes	Yes	Yes	Yes	Yes	INP
WEST	E-B	E-P	E-P-1	% Share	P-B	Per Capita	Yes	Yes	No	Yes	Yes	Yes	Sensitivity

Abbreviations for Items

Econ

I-O = Input-Output
E-B = Export Base

Dem

CC-S = Cohort Component Survival
E-P = Employment - Population Ratio

Interface

E-M-1 = Employment - Migrations - One phase
E-P-1 = Employment - Population - One phase
E-M-M = Employment - Migration - Multiphase Procedure

Subarea Distribution

% Share = Distribution to subareas on bases of Employment or population ratio
Gravity = Gravity Allocation Model
LP - Linear Programming Model

Service

P-B Population Based Projections

Fiscal

Per Capita = Per Capita Costs and Revenues
Facility = Projections of facility requirements also completed

INP = Information Not Provided
NA = Not Applicable

[1] Cohort Component Survival Method used at Regional level only.

(Derived from Leistritz and Murdock, 1981)

Table 3. USE CHARACTERISTICS OF SELECTED SOCIOECONOMIC IMPACT ASSESSMENT MODELS

	Input Data Requirements			Flexibility		Computerization	
Model	Source	Geographical Level	Form	User-Alterable Parameters	Degree of User Interactivity	Model Language	Transferability
ATOM-3	State and Local	State and County	Primary I-O Other Secondary	None	None	FORTRAN	Other Models closely related (BREAM)
BOOM-1	State and Local	County and City	Secondary, Judgemental	None	None	GASP IV	Yes-Texas
BREAM	State and Local	Region and County	All Secondary	None	None	FORTRAN	Untested
CLIPS	State, Local Western U.S.	Region, County, City	All Secondary	SD, PC INP	Interactive	FORTRAN	Untested
CPEIO	State and Local	The given level of analysis	Primary I-O Other Secondary	SD, PC AE, UNEMP.. Output	Interactive (Knowledgable User)	SIMSCRIPT	Untested
HARC	National, State and Western U.S. Judgemental	County	All Secondary	None	None	INP	Untested
MULTIREGION	National and Regional	National and Regional	All Secondary	None	None	FORTRAN	Untested
NAVAHO	National and Reservation	Reservation and District	All Secondary	None	None	FORTRAN	Untested
NEW MEXICO	State and Regional	State, Region County	Primary I-O Other Secondary	None	None	INP	Untested
RED	State, Region, Local	State, Region, Local	Primary I-O Primary Labor Force Other Secondary	SD, PC BR, IR TR, GM Output	Interactive	APL	Yes-Texas
SEAM	National and Regional	National and Regional	All Secondary	SD, PC Impact Area	Interactive	INP	Untested
SIMPACT	Regional, State and Local	Region County and Local	INP	INP	Interactive	FORTRAN	Untested
WEST	State and Local	State and Local	All Secondary	None	None	FORTRAN	Untested

SD = Starting Date
PC = Project Characteristics
AE = Available Employment
UNEMP. = Unemployment
OUTPUT = Type or form of Output
BR = Birth Rate

IR = Inflation Rate
TR = Tax Rate
GM = Gravity Model Coefficients
IMPACT AREA = Selection of Impact Area
INP = Information Not Provided

(Derived from Leistritz and Murdock, 1981)

AN INTERACTIVE APPROACH FOR COMMUNITY DEVELOPMENT DECISIONMAKING

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University of Kentucky

The effective delivery of computerized decision aids for policymakers who must deal with problems of economic development has been of increasing interest to both extension and research workers in rural development. This paper describes efforts recently completed at the University of Kentucky that we feel represent the most advanced approach yet available with respect to the delivery on a comprehensive planning model for rural development.

Past efforts to introduce computerized decision making to decisionmakers in Florida and elsewhere have usually utilized the "batch" approach. Users were provided with a perhaps somewhat lengthy input form which was filled out and returned to the University research or extension workers responsible for running the model. These personnel then inputted the data in batch mode from cards or terminal to the computer, the model was run, and output was returned to the user. The process took from one to several days and required a degree of involvement on the part of University personnel to ensure accurate results.

The Interactive Approach

The interactive approach utilized at Kentucky incorporates a number of features that, we believe, build upon and enhance the capabilities provided in other states. First, we utilize essentially the same computerized planning model that Florida has been using in batch mode for a number of years, adapted with data specific to Kentucky and its cities, counties and regions. In other words, the model provides the same amount and quality of information that Florida has been able to provide in their batch version, and yet, provides these results in minutes instead of days.

Input Design

However, the feature we regard as truly unique is the input design. Instead of a form users respond to a series of questions. The model was built as part of Kentucky's ANSER system. After a simple Log-on procedure, users merely type in the name of the program. A comprehensive array of ANSER features ensures that once the program name has been entered, the user would be supplied with enough assistance from the computer to virtually ensure that he could recover from any problem he runs into in running the model without the need for assistance from University research or extension personnel.

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This approach has become particularly important in working with growth impact models for rural development at Kentucky. Kentucky has no state extension specialist directly responsible for impact analysis work. As a result, the input form had to be designed not only as a data input device, but also as an educational tool designed to provide the user with much the same kind of assistance that would have been received had the user had a state extension specialist working with him.

Overriding Base Plan Values

The input consists of some 173 questions that are answered by the user interactively. For all but a few of these questions, a base plan value has been stored within the model supplied by the model builders. These data include direct and indirect income and employment multipliers for each of 56 sectors for each of Kentucky's 120 counties which were obtained from secondary data by stepping down from a national input/output table. In addition, base plan data include numerous other items such as retail sales data and expenditures for various public services for city and county governments. The level of detail closely parallels that contained in the Florida model.

An important feature of the approach is the ability of the user to easily override any of the base plan values under his control. Each time a question is asked by the model, the base plan value is also displayed. If the user agrees with the figure, he presses the return key on the terminal. If he has reason to believe that he can supply a figure better than the base plan value because of a structural change or a change in expenditure levels in the particular area, he need merely enter the alternate figure, and that value is introduced when the calculations are done. Display of base plan values as questions are answered assists the user in attempting to determine if he can supply more accurate information. In addition, the user is educated as to what are considered to be normal values for a diverse array of multiplier and expenditure items. The input thus provides a systematic exercise for educating the user with respect to the kinds of information and assumptions that are necessary to conduct a detailed and comprehensive impact analysis report.

Even critics who believe that multipliers derived from secondary data are inappropriate for the special characteristics of a new industry in their local community are answered. The step-down approach used to derive multipliers for the model assumes that the same production function and technology applies to a sector at all levels of geographic aggregation. If users believe that unique characteristics of a local industry exist that would alter a multiplier, the need merely introduce an alternative value and observe the resultant impact. "If this, then this" kinds of analysis can be easily handled, for the computer can work out the ramifications of alternative values for a particular multiplier in minutes. This is, in effect, a sensitivity analysis. The ability to quickly do a number of analyses that systematically compare impacts of alternative multiplier values is one of the key features that make the interactive approach so much more appealing than working in a batch mode, where decision-makers may be reluctant to pose more than one or two alternatives that they would like to see run. In fact, the interactive approach, with its inherent simplicity, encourages the user to experiment with alternatives. This can only contribute to a greater understanding on the part of the user as to how the economic growth process works.

Help for the User

Another key feature of the interactive approach is the ability to provide help to the user in much the same way that a state extension specialist might if he were working directly with the user. This is done through the use of a HELP command available for each question. Each question is intentionally kept quite short. This is necessary to ensure that the model can be run in a reasonable length of time on a low speed (30 characters per second) terminal. If the user needs definitions or additional information to determine if he should override the base plan value, he merely types in the word HELP. The computer then provides additional information which further details definitions and terms used in the question. The HELP command is thus not only an aid for the user in answering the requested information but also a tool to help educate the user with regard to important terms and concepts used in growth impact analysis. The work we have completed here closely parallels systems designed for computer-assisted instruction.

Reducing the Chance for Misleading Information

University personnel have often been wary of turning users loose with growth impact analysis models without some fairly close supervision by a research or extension worker familiar with the model. These concerns have centered around the belief that users unfamiliar with growth impacts models could insert data into them that was simply wrong or completely out of any valid, reasonable range, and get results that were quite unreliable. A particular concern is a result that would substantially overstate the positive economic impacts of a planned industrial development. These results would then be interpreted by the user to the public as the University's view with regard to the impacts of a proposed development. The result is that the University would be put in a position of defending itself from the potential misuse of the growth impacts model.

While we hve not yet introduced a feature to limit this sort of misuse of the interactive growth impacts model, we are considering the implementation of a plan suitable only for an interactive system that we feel would substantially reduce the potential for misuse attributable to the insertion of numbers that were wrong or, at least, outside the range of values that we consider to be appropriate for a data item.

Two approaches may be used. The first would be to identify, for each value under the control of the user, a "proper" range over which that value might vary. If the user entered a number outside the predetermined range, the program would loop through a series of statements informing the user of what he did and then completely prevent him from continuing until he inserted a number within the range the University personnel consider appropriate. For example, this scheme might prevent a user from inserting a direct employment multiplier for a particular industry of 5, when the reliable range for that industry might only be from 1 to 2.

A second approach might be to not stop the program entirely, but if a number outside the predetermined range is entered, the program would enter a loop which would flag the user and quiz him as to whether or not what he inserted into the model is what he really wanted to do, as a double-check on the users intentions. This would not totally prevent him from running the model with the numbers he selected, even if University personnel did not believe such a value is appropriate.

Implementation of either approach awaits additional experience on our part in determining reliable ranges for each user-controlled value. We will no doubt use a combination of these approaches with the first approach only being used for those questions in which a value outside the predetermined range should never be inserted since results of a run using values outside the predetermined range could be very misleading and potentially detrimental to the University.

Assumptions versus Output

Another key advantage of an interactive approach is that since both the input and the output are displayed and printed at the users terminal, the output that is produced by the model is presented with the set of questions and input values used in generating the output. The combination of base plan and user modified values that are the answers to the questions really represent many of the assumptions used in deriving the output. In the case of batch run model, the input form is easily separated from the model output. Moreover, with other approaches, if the user wants access to base plan values specific to his county or local community, he normally must find these values by looking them up in large, cumbersome tables provided in a users manual.

This is not conducive to understanding base plan assumptions. Here we use the computer as a modified data base management device. When the user selects a specific location and industry for a planned development, the computer automatically searches the complete data file containing base plan values for multipliers and other data for those values that are specific to the particular location and industry the user selected. The base plan values for displayed for each question consist of only the value specific to the location and industry for which the run applies. With this approach, there is never any doubt as to what values were actually used in generating the run.

Output Interpretation

Compared with the approaches we have used for input, our approach to providing interpretation of output has been somewhat more conventional. We are publishing a manual designed to provide the user with specific information for accessing the computer and the model as well as a comprehensive interpretation of each of the tables of output. The approach used here follows more closely the approach used for the batch version of the model in other states. Detailed information on the interpretation of each data item is presented. If there is sufficient interest to warrant it, we may eventually include parts of this so that it can be accessed from the computer as the output is being displayed. However, the combination of input and output is currently nearly at the feasible limits in relation to print speed capability of a low speed terminal. A detailed interpretation of model output would have to be optional with access under the user control for such an approach to be feasible. An approach similar to the HELP command on input is probably appropriate.

In addition to a comprehensive treatment of model output, the manual will also include an overview of growth impact analysis and a description of the model, and the kinds of problems to which it is adaptable. An effort will be made to explain enough of the inner workings of the model so that it will not be treated as a "black box" by the user. This manual will be sent to county agents, state governments decisionmakers, and others who over the 2½ year period we have worked on this have expressed an interest in learning about and potentially working with the model.

Conclusions

The interactive approach that we have used for community development growth impacts analysis at Kentucky has a number of features that we feel are equal or superior to those used in the past by other states. These features include the following:

Nearly Instantaneous Output. We feel instantaneous output provides an environment conducive to the generation of interest in, and enthusiasm for, growth impacts analysis unmatched by an other approach. Users get to see the impacts of their situation almost immediately, and the approach facilitates user experimentation and sensitivity anslysis.

Model as Comprehensive as Batch Versions. Our interactive model provides output that in every way is as location-and industry-specific and with the same amount of detail present in batch versions operating at Florida and elsewhere. In no way did we compromise the quality of the report relative to that obtained from widely used batch versions.

Educational. We like very much the characteristics of our approach that border on a true computer-assisted instructional environment. We see further efforts with computerized decision aids not only for growth impact analysis, but also for farmers and others, as headed in this direction. We see this as being broadly consistent with the land grant function of not only providing data, but also providing educational understanding.

Reduction of Potential for Misleading Results. We see much potential for use of an interactive computer environment for reducing the probability that a growth impacts model will be run with inappropriate data and thus generate misleading results. We have only scratched the surface of the potential for checking inappropriate user-entered input.

Lessened Use of Personnel. In some respects, at Kentucky, we were forced into an interactive approach that would need only a low level of regular support by extension faculty, due to limited human resources. But at the same time, these limitations of human resources forced us to develop schemes for dealing with problems that were perhaps more creative and innovative than would have been the case had we had more rural development extension personnel. We are confident that if other states are to meet the demands placed on their extension specialists with respect to needs for computer-assisted decisionmaking with the limited resources that are available, they will need to look to techniques that build upon the approaches we have used in Kentucky.

Clearly, we have not solved all the problems with respect to the delivery of growth impact analysis models at Kentucky. Many of the schemes we have invented require further analysis, experimentation and study. In addition, our approach makes use of a large interactive computer owned by the University of Kentucky, College of Agriculture. As a result, such an approach may not necessarily be feasible in all states. However, with the advent of powerful but low cost microcomputers, it will be feasible to replicate most if not all of the features of the approach and model described here. The potential of this looks promising, with the as yet unresolved problem being the development for storing and accessing subsets of the large data sets used by the model.

THE ECONOMIC IMPACT ASSESSMENT MODEL (EIAM)
A COUNTY LEVEL ECONOMIC IMPACT ASSESSMENT MODEL*

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ENERGY AND ENVIRONMENTAL SYSTEMS DIVISION
ARGONNE NATIONAL LABORATORY

MAY 1982

* slide presentation

AGENDA

- Overview of EIAM
- Description
- Methodology
- Components
- Parameters
- Example
- Questions and Answers

EIAM AS A COMPUTER MODELLING SYSTEM.

EIAM IS A COMPUTER MODELLING SYSTEM WHICH HAS THE CAPABILITY OF BEING USED AS A DATA RESOURCE, AN IMPACT ASSESSMENT TOOL, AND A POLICY SENSITIVITY ANALYSIS MECHANISM FOR ASSESSING THE POSITIVE AND NEGATIVE IMPACTS INCURRED FROM ECONOMIC DEVELOPMENT IN A COUNTY.

EIAM FUNCTIONS AS AN IMPACT ASSESSMENT TOOL

THE EMPLOYMENT IMPACT PROJECTION MODULE OF EIAM IS THE PRINCIPAL MEANS FOR A USER TO ASSESS THE POSITIVE AND NEGATIVE EFFECTS INDUCED BY AN INDUSTRIAL DEVELOPMENT. THROUGH USER SPECIFICATION OF (1) THE HOST COUNTY, (2) THE TYPE OF OF FACILITY (IES) EXPECTED TO BE CONSTRUCTED, AND (3) THE YEAR OF EITHER OPERATION OR CONSTRUCTION, THE MODEL

SIMULATES THE PROSPECTIVE EMPLOYMENT IMPACTS TO OCCUR IN FUTURE PERIODS. THIS IS DONE THROUGH UTILIZATION OF BASELINE DATA ON THE SIZE AND COMPOSITION OF THE HOST AND ADJACENT COUNTY POPULATIONS TOGETHER WITH THEIR RESPECTIVE SOCIOECONOMIC PARAMATERS.

- EIAM IS COMPRISED OF THREE SUBMODELS

(1) DEMOGRAPHIC PROJECTION MODULE

THIS MODULE PROVIDES THE USER WITH A DATA RESOURCE: POPULATION PROJECTIONS FOR THE SUBJECT COUNTY AND UP TO EIGHT ADJACENT COUNTIES. THE USER HAS THE OPPORTUNITY TO REQUEST TABLES WHICH DISPLAY AGGREGATE POPULATION PROJECTIONS TOGETHER WITH THOSE FOR EACH SEX CATEGORY (MALE AND FEMALE). EACH TABLE PRESENTS THE PROJECTIONS FOR NINETEEN AGE GROUPS BETWEEN THE YEARS 1980-2000. THE DATA PRESENTED ARE BASED PRINCIPALLY ON THE 1980 CENSUS SURVEYS WITH SUBSEQUENT YEARS PROJECTED WITH COHORT-SURVIVAL METHODOLOGY.

(2) Employment Impact Module

BASED ON A NUMBER OF TECHNOLOGICAL AND SOCIOECONOMIC PARAMETERS WHICH ARE SUBJECT TO USER MODIFICATION, THIS MODULE SIMULATES (1) THE DIRECT AND INDIRECT EMPLOYMENT REQUIREMENTS FOR THE INDUSTRIAL DEVELOPMENTS PLANNED IN THE SUBJECT COUNTY, (2) THE PROBABLE NUMBER AND GEOGRAPHIC SOURCE OF AVAILABLE MANPOWER AND (3) THE POPULATION AND HOUSEHOLD IMPACTS RESULTING FROM ATTAINMENT OF MANPOWER EQUILIBRIUM. A PRINCIPAL DATA INPUT TO THIS SIMULATION CONSISTS OF POPULATION PROJECTIONS FROM THE Demographic Projection Module FOR THE SUBJECT AND ADJACENT COUNTIES.

(3) Public Costs and County Fiscal Module

* BASED ON THE INCREMENTAL POPULATION INDUCED IN THE HOST COUNTY AS A RESULT OF INDUSTRIAL DEVELOPMENTS, THIS MODULE FORECASTS ANNUAL CAPITAL AND OPERATING/ MAINTENANCE COSTS OF SUPPLYING THE INCREMENTAL POPULATION WITH PUBLIC SERVICES SIMILAR TO THOSE ENJOYED BY PERMANENT RESIDENTS.

- THE GEOGRAPHIC FOUNDATION OF EACH MODULAR COMPONENT IS THE COUNTY.
- REVENUES AND EXPENDITURES CAN BE ESTIMATED ON THE BASIS OF REGRESSION EQUATIONS THAT SIMULATE DIFFERENT FUTURE TRENDS: MODERATE INDUSTRIAL GROWTH, RAPID INDUSTRIAL GROWTH, RETIREMENT/RECREATION GROWTH, AND INDUSTRIAL DECLINE.

EIAM METHODOLOGY

- THE POPULATION OF A COUNTY IS PROJECTED FORWARD USING FERTILITY, MORTALITY, AND MIGRATION RATES. THESE PROJECTIONS PROVIDE A POPULATION BASE FOR DETERMINING THE SUPPLY OF AVAILABLE LABOR.
- THE USER CAN OVERRIDE A NUMBER OF THE INTERNALLY STORED PARAMETERS. ONCE ALL THE USER-SPECIFIED OR DEFAULT PARAMETER INPUTS HAVE BEEN ESTABLISHED, ECONOMIC BASE PROCEDURES ARE USED TO DETERMINE THE NUMBER OF SECONDARY (INDIRECT AND INCOME-INDUCED) JOBS RESULTING FROM THE DEVELOPMENT SCENARIO. THIS IS ACCOMPLISHED WITH AN EMPLOYMENT MULTIPLIER, CONSTRUCTED FROM DATA SPECIFIC TO THE COUNTY BEING ANALYZED.

- These direct and indirect labor requirements are then correlated with the potentially available resident and commuting labor force. When the subject county cannot satisfy the new labor needs, commuting workers from adjacent counties are assumed to be available to augment the labor pool. Immigration is assumed to meet any new labor requirements not met by local labor.
- Tables provide data from intermediate steps to indicate how population impact effects of employment-induced migration were determined. The number of employed local residents, immigrating workers, households and final population size are presented and input into the Public Costs and County Fiscal Module.
- The Public Costs and County Fiscal Module utilizes calculated employment effects of the developments together with county characteristics to provide annual incremental county public service and facility costs for the peak and sustained long-run population changes caused by the immigration. The costs are presented for a number of community services. Per capita county revenues and expenditure estimates are also presented.

POPULATION

- DEMOGRAPHIC PROJECTION MODULE -

- PROJECTS ANNUAL COUNTY POPULATION BY AGE, SEX, AND RACE.
- THE COHORT-COMPONENT PROJECTION METHODOLOGY IS EQUIVALENT TO:

  CURRENT POPULATION
  + BIRTHS
  - DEATHS
  + IN-MIGRATION
  - OUT-MIGRATION
  = FUTURE POPULATION

EMPLOYMENT

- EMPLOYMENT IMPACT PROJECTION MODULE -

STEP 1

- IDENTIFY COUNTY TO BE ANALYZED
- SELECT ECONOMIC DEVELOPMENT TO BE SIMULATED
- DIRECT LABOR REQUIREMENTS CREATE DEMAND FOR NEW SECONDARY WORKERS
- EXPORT BASE EMPLOYMENT MULTIPLIERS ESTIMATE SECONDARY JOBS WHICH ARE ALLOCATED TO THE SUBJECT AND ADJACENT COUNTIES
- SECONDARY EMPLOYMENT IS LAGGED TO REPRESENT ITS SLOWER BUILDUP COMPARED TO BASIC EMPLOYMENT
- TOTAL JOBS IS THE NUMBER OF NEW BASIC AND ADJUSTED SECONDARY WORKERS REQUIRED DURING THE CONSTRUCTION AND OPERATION PERIODS OF THE NEW ECONOMIC DEVELOPMENT.

EMPLOYMENT

- EMPLOYMENT IMPACT POJECTION MODULE -

STEP 2

* AVAILABLE WORKERS (LABOR FORCE) = LOCAL POPULATION

X PERCENT NEW WORKERS (LABOR FORCE PARTICIPATION RATE INCREASE)

X UNEMPLOYMENT RATE DIFFERENTIAL (DIFFERENCE BETWEEN LOCAL AND LOWEST ACHIEVABLE UNEMPLOYMENT RATES)

AVAILABLE WORKERS = BASIC WORKERS + SECONDARY WORKERS

TOTAL AVAILABLE WORKERS = LOCAL AVAILABLE WORKERS + WORKERS WILLING TO COMMUTE FROM NEIGHBORING COUNTIES

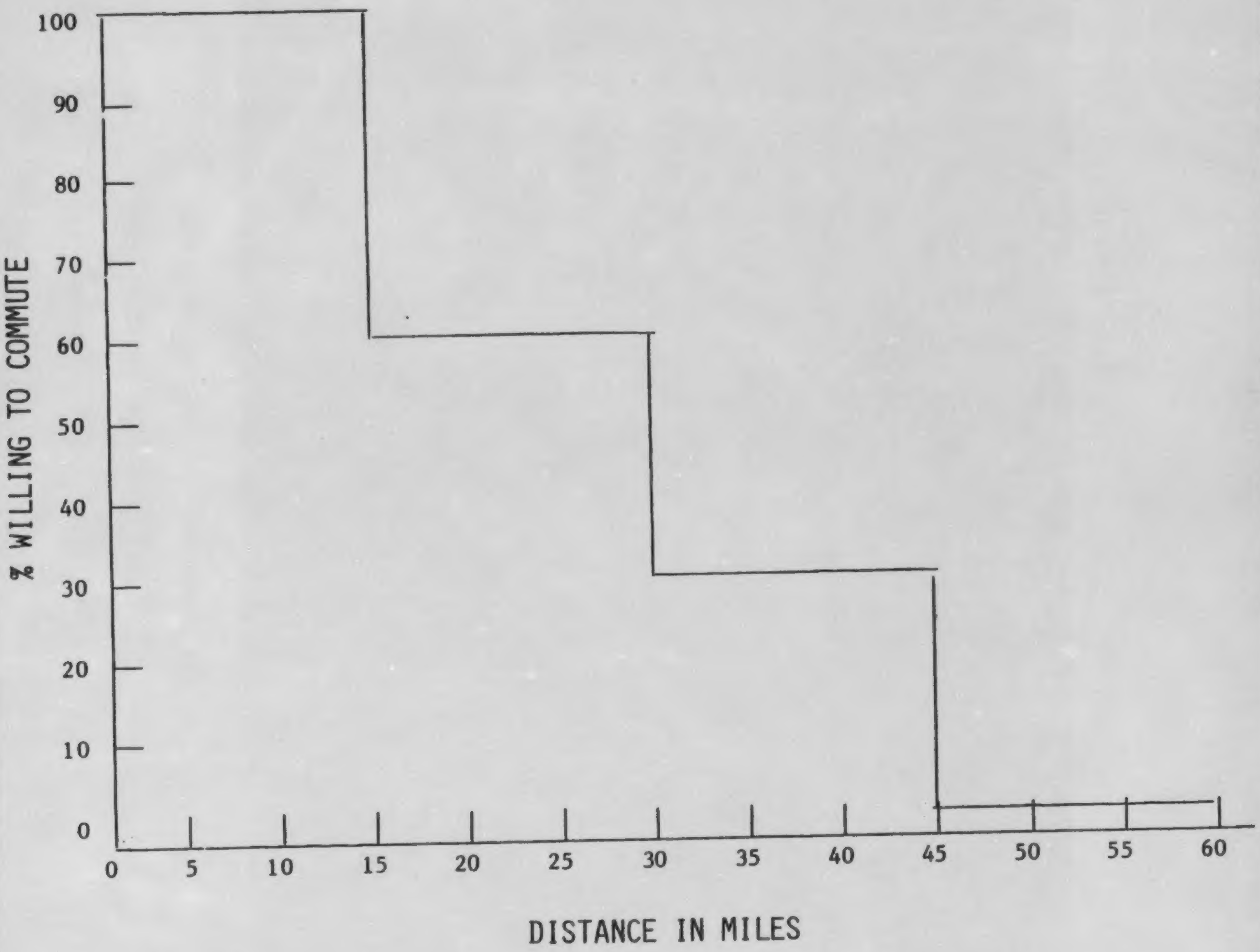
BASIC WORKERS

BASIC WORKERS ARE PEOPLE EMPLOYED IN JOBS THAT PRODUCE THINGS THAT ARE SOLD OUTSIDE OF THE COUNTY SUCH AS AGRICULTURE, MINING, MANUFACTURING, CONSTRUCTION, TRANSPORTATION.

BASIC WORKERS' WAGES ARE CONSIDERED "NEW" MONEY IN THE COUNTY. THIS "NEW" MONEY IS THOUGHT TO BE THE BASIS OF GROWTH IN THE COUNTY.

SECONDARY WORKERS

SECONDARY WORKERS ARE PEOPLE EMPLOYED IN JOBS THAT PRODUCE GOODS AND SERVICES SOLD IN THE COUNTY, SUCH AS RETAIL TRADE, LOCAL GOVERNMENT, SERVICES (GAS STATIONS, DOCTORS, SHOE REPAIR, ETC.).


100
90
80
70
60
50
40
30
20
10
0
% WILLING TO COMMUTE
0
5
10
15
20
25
30
35
40
45
50
55
60
DISTANCE IN MILES

POPULATION EFFECTS

- EMPLOYMENT IMPACT PROJECTION MODULE -

STEP 3

- THE INCREMENT BETWEEN THE TOTAL AVAILABLE WORKERS AND THOSE REQUIRED BY THE NEW INDUSTRY IS SATISFIED BY IN-MIGRATION

- POPULATION EFFECTS = NUMBER OF IN-MIGRANT NEW BASIC/SECONDARY WORKERS
X NUMBER OF PEOPLE PER FAMILY

- NEW HOUSEHOLDS CREATED = POPULATION EFFECTS
X NUMBER OF PEOPLE PER HOUSEHOLD WHO WORK

PUBLIC COSTS

- PUBLIC COST MODULE -

PUBLIC COSTS = NEW PEAK CONSTRUCTION AND LONG-TERM (SUSTAINED) POPULATION X PUBLIC COSTS PER PERSON

CATEGORIES - SOCIAL WELFARE
HOSPITAL
POLICE
FIRE
SEWAGE
SOLID WASTE
RECREATION
LIBRARIES
GENERAL GOVERNMENT
WATER TREATMENT
EDUCATION

ECONOMIC IMPACT ASSESSMENT PARAMETERS

HOST COUNTY

1. CONSTRUCTION EMPLOYMENT MULTIPLIER (SECONDARY)
2. OPERATION EMPLOYMENT MULTIPLIER (SECONDARY/ BASIC)
3. BASIC SECTOR HOUSEHOLD FACTOR
4. SECONDARY SECTOR HOUSEHOLD FACTOR
5. MALE BASIC WORKFORCE PROPORTION
6. FEMALE BASIC WORKFORCE PROPORTION
7. BASIC FEMALE WORKFORCE PROPORTION
8. BASIC SECTOR IMPACT COUNTY COMMUTER WILLINGNESS
9. SECONDARY SECTOR IMPACT COUNTY COMMUTER WILLINGNESS
10. BASIC SECTOR WORKERS PER IN-MIGRANT HOUSEHOLD
11. SECONDARY SECTOR WORKERS PER IN-MIGRANT HOUSEHOLD
12. UNEMPLOYMENT RATE DIFFERENTIAL
13. DISAGGREGATED VS. AGGREGATED LABOR FORCE PARTICIPATION RATES

ADJACENT COUNTY AND COMMUTER WILLINGNESS FACTORS

- REVENUE AND EXPENDITURES MODULE -

Revenue & Expenditures = New population x revenue and expenditures per person

Categories - Revenue (Total and per capita)

Total
Taxes
Charges
Transfers

Expenditures (Total and Per Capita)

Total
Capital
Operations
Education
Police
Hospitals
Highways
Annual interest payments

Debt (Total and per capita)

Total
Long-term school debt

EIAM OUTPUT PRODUCTS

- ANNUAL PROJECTIONS OF POPULATION BY AGE, SEX AND RACE.
- ANNUAL DIRECT EMPLOYMENT REQUIREMENTS OF ECONOMIC DEVELOPMENT.
- ANNUAL ESTIMATES OF INDIRECT (SECONDARY) EMPLOYMENT REQUIREMENTS CREATED BY THE PRESENCE OF THE NEW ECONOMIC ACTIVITY, ADJUSTED TO REFLECT TRADE AREA INFLUENCES.
- ANNUAL PROJECTIONS OF THE LOCALLY AVAILABLE WORK FORCE.
- ANNUAL PROJECTIONS AND CHARACTERIZATIONS OF IN-MIGRATING WORKER HOUSEHOLDS.
- ESTIMATES OF THE PUBLIC COSTS OF PROVIDING THESE ADDITIONAL PUBLIC SERVICES.
- ESTIMATES OF COUNTY REVENUES AND EXPENDITURES REQUIRED TO SERVE NEW POPULATION.

A PEN AND PAD PROCEDURE FOR ESTIMATING COMMUNITY ECONOMIC IMPACTS

John Gordon
University of Florida

Introduction

The purpose of this paper is to offer instruction on estimating the economic, demographic and fiscal impacts of change in a local economy with the aid of a simple framework which can be utilized without the assistance of a computer. The change analyzed may be either the addition or loss of economic activity. The method of impact analysis presented is fairly unsophisticated, but the conceptual framework draws upon community economic analysis models currently available in the Food and Resource Economics Department of the Institute of Food and Agricultural Sciences at the University of Florida. Although by no means identical, the tabular output resembles corresponding tables from the computerized Community Economic Impact Model developed by Ken Clayton.

Economic change can be introduced into a community from a number of sources. In this example, we shall assume a new industry is considering a location in the community. Also, assume that it is the operating (rather than construction) impacts which are of interest. The introduction of a new industry into a community (or its loss) creates a multitude of changes in the local economy. In the framework discussed, impacts are estimated and broadly categorized as (1) private sector economic impacts such as employment, income and sales; (2) demographic impacts such as numbers of new people, new houses and new students and (3) public sector fiscal impacts which include an identification of how revenues and expenditures for the various units of local government may be affected. This information is prepared in close cooperation with and then presented to individuals, officials, groups, and agencies who are actors in the community economic or growth management process.

An important contribution to local government officials and interested residents of community economic impact models is the reasonable use of "multipliers" which indicate the magnitude of the "respending" or "ripple" effects. Multiplier effect refers to the total or overall impact stimulated by the initial changes in economic activity. Impact analyses utilize income, employment, and sales (output) multipliers depending upon the economic dimension relevant for the particular study. In Florida, multipliers for sales, employment and income are available for fifty-two industries in each of the state's sixty-seven counties. Alternative sources of multipliers exist, and the lack of a readily available set of county multipliers should not be viewed as a reason not to do an impact study.

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the original document was blank.

Using the appropriate multipliers plus some basic information about the project, an analyst can use this pen and pad framework to estimate a number of economic impacts in a local economy. Basic information required about the new industry includes annual sales, payroll and employment. Obviously, the more specific the information about the immediate changes that the analyst possesses, the more accurate the estimates of impact will be.

Before proceeding to an explanation of a pen and pad framework, let me emphasis that this is not the only such framework. It is a framework that I have found useful in community economic education. It helps me organize and explain community economic impacts to non-economists. It is not suggested that the output of this model is as accurate as more sophisticated computer models. It is a conceptually simple framework and, therefore, can be easily criticized by any economist.

A Pen and Pad Approach

Assume a new industry plans to locate in Example County, and the likely economic and demographic impacts of this event are of interest to citizens. A pen and pad version of a community economic impact analysis is demonstrated. Each table of the impact analysis is systematically described in the following explanation.

Table 1. Description of Development

The first table of the form is straightforward. It contains three elements: (item 1) the location, (item 2) type, and (item 3) annual sales of the new industry. This information, seemingly obvious, is very important. The location must specify whether the industry is in the jurisdiction of a city. In this example, the industry location is assumed to be in Example County, but not within a city. Location of new industry (item 1) specifies the "community" referred to in the following tables. In this example, the study community is Example County. The type of industry must also be carefully specified (SIC code) so that the appropriate multipliers are used. The annual sales figure is critical in estimating the sales of related local businesses. The bakery products, SIC 1418, company has annual sales of $30 million.

Table 2. Employment Impacts

A careful review of this table is essential for two reasons. First, correctly estimating the employment impacts of a project is crucial to the subsequent tables, and, secondly, the employment data inputs require making several major assumptions. Two basic pieces of information are especially desired from this table: (1) the number of net new jobs being created (or lost) for existing county residents and (2) the number of workers moving into the county to take new jobs. Be alert for distinctions between employment for residents versus non-residents and, also, for existing residents verus new residents.

This table begins by listing the gross number of new jobs being offered at the plant. Generally, this number is readily available and is freqently referred to as new direct employment at the plant. In this example, it will be assumed that the new plant will hire 300 direct employees (item 4).

At this point, it is necessary to work toward an estimate of the number of these 300 direct jobs which will actually be filled by existing county residents (item 9) and net new direct employment in the county (item 10). Four situations can reduce the net employment effect of these newly available positions to existing county residents.

(1) Obviously, the number of new employees moved in by the company and any other positions expected to be filled by new residents should be noted (item 5). Here this number is assumed to be 30.

(2) Residents of neighboring counties accept some of the new direct jobs and commute daily from outside Example County. These are new direct jobs, but not for residents of Example County. In the example, assume 70 incommuters (item 6).

(3) The appearance of new jobs in a community may prompt some local residents who commute out of the county to switch to the in-county jobs. These jobs, then, are taken by existing residents who are already employed. Hence, this occurrence results in a reduced increase in local employment. Assume, in this example, a reversal of commuting by 25 residents (item 7).

(4) In most instances a local resident changing from an existing job to one at the new plant will be replaced in his former position. Sometimes, however, the former job will be left vacant or eliminated. This may occur when that job position was held by a family member or if business activity was especially slow. In such cases, the employee has simply shifted jobs, with no additional employment created. We will assume 5 such cases in this example (item 8).

What's left of the original 300 jobs after deductions of 30, 17, 25 and 5? Simple subtraction reveals that what is left is 170 net new direct employment positions to existing county residents (item 9). This figure is comprised of three categories of employees:

(1) those that were previously unemployed

(2) those that were not in the labor force

(3) those who shifted from jobs within the county and their vacancies were refilled by county residents

Now the analyst can add the estimated new workers who will permanently move into the county to work at the plant (here assumed to be 30) and the previously estimated number of new jobs filled by existing residents (170) with a result of 200 as the estimate of the net new direct employment in the county (item 10). To reiterate, this figure now includes both new resident workers, item 5, and existing county residents, item 9.

At this juncture, the employment multiplier specific for the county and industry in question is needed. Multipliers are not determined within this simple framework and must be estimated exogenously. The employment multiplier (assumed to be 1.60) is reduced by the 1.00 direct employment (item 11) and multiplied by the 200 net new direct employment positions in the county (item 10) - yielding a product of 120 (item 12). This figure reflects the indirect and induced jobs created by the direct employment. Total employment created from the direct employment of 200 county residents and 120 indirect and induced jobs is 320 (not shown as an item number).

The 120 indirect and induced employees all work within the county, but they are not necessarily county residents. To determine the net effect on existing county residents, subtract the number of jobs filled by new residents, in-commuters, formerly out-commuting residents and the unfilled jobs left vacant or eliminated when workers shifted to new positions from the total indirect and induced employment estimated to work in the county (item 12). The result of these steps is the net new indirect and induced employment to existing county residents. If we assume 3, 10, 6, and 2 as the subtracted values (items 13, 14, 15 and 16), respectively, the net new indirect and induced employment figure to existing residents will be 99 (item 17). Total net new emploment for existing residents is shown (item 19) as 269 (the sum of items 9 and 17).

Any new workers (item 13) expected to move into the county as part of the expanded indirect and induced employment can now be added back to the 99 indirect and induced employment of existing residents (item 17). Here we assumed a small number, 3. This summation yields the net new indirect and induced employment in the county - including both existing and new residents of 102 (item 18). We can now add the net new direct and net new indirect/induced jobs to get the total net new jobs in the county (200 plus 102) or 302 in this example (item 10 plus item 18 equals item 20).

Table 3. Demographic Impacts

The third table indicates the overall changes in local population that can be anticipated as a result of the new employment opportunities. This information will be valuable later in estimating public sector finances. Item 21 is a listing of the number of people in the study area. The number of additional residents is very simply estimated as the product of the new county resident workers multiplied by the average household size. Table 2 shows the former number to be 33 (items

5 and 13) and household size is here estimated at 3.0; hence the additional residents are estimated to be 99 (item 23).

Knowledge of the local housing situation is essential to properly make the next estimate. The additional households, that is, families, are assumed in this example to be identical with the new resident workers. (The only exceptions would be if more than one new worker came from the same family.) The number of new housing units needed to accommodate any influx of new workers depends on the availability of dwellings in the county. In this example, a very low vacancy rate is assumed, and 25 new housing units will be required (item 24).

Additional public school enrollment is estimated very simply by multiplying the proportion of school age expected in the new population by the number of new residents expected, 0.20 times 99 equals 20 new school age children.

Table 4. Local Business Sales

The information generated in Table 4 shows how the presence of the new business will affect sales of existing local enterprises. This calculation begins with the gross annual sales made by the new industry. That is assumed to be $30,000,000 in this example (from item 3) and is termed "direct sales" (item 26). The output or sales multiplier from the computer model for the Bakery Products Sector of Example County is 1.90; for every one dollar sold outside the county by the plant, an addtional $0.90 of business activity is generated within the county (item 27). This spin-off business is termed "indirect and induced sales" and amounts to $27,000,000 in Example County (item 28).

Indirect and induced sales include three separate components. The first involves the sales of materials and services to the plant from county businesses. Although the magnitude of these sales cannot be determined directly using this method of analysis, it is revealed in input-output models. The second component of the ripple effect is local sales to the aforementioned firms; i.e., all the local sales of services and materials to those businesses dealing directly with the new industry. These first two components are indirect sales. The final aspect of local business stimulation are induced sales; the local spending for the wole range of goods and services demanded by households earning new direct and indirect income.

Total local business purchases is the sum of direct, indirect and induced business activities and is $57,000,000 in this example (item 29).

Table 5. Personal Income

The effect of a new industry and new jobs on local income is revealed in Table 5. The value estimated is the total new personal income available to county residents.

The estimation begins with the total payroll at the plant. In the example, the direct employee payroll at the plant is given as $3.0 million (item 30). This figure is then augmented to reflect new direct personal income; this being essentially wages and salaries plus other employee compensation excluding the employer's share of social security contributions. The degree of employee fringe benefits can vary substantially between firms. New direct personal income in this example is assumed equal to payroll plus approximately 20 percent or $3.6 million (item 31).

To derive the impact on county personal income, the previous figure must now be reduced to reflect only those direct employees living in Example County - both existing and new residents. One hundred seventy or 56.7 percent of the new workers are existing residents. They will receive an estimated $2,041,000 of the new direct personal income (item 32). Two-thirds of the 300 direct employees, 200, are, or will be, county residents. Therefore, 66.7 percent of the new direct personal income will accrue to residents - $2,400,000 in the example (item 33).

Now the new indirect and induced personal income to county residents is calculated, assuming an income multiplier of 1.80 (item 34). One dollar of direct personal income to residents creates total income in the county of $1.80. The estimate of indirect and induced income is $1,920,000 (item 35). Total new personal income is the sum of direct personal income to residents and indirect and induced personal income to residents, $4,320,000 (item 36).

Table 6. Taxable Property Value

The final two tables address public sector impacts of community economic change; namely, what happens to local government revenues and expenditures. Table 6 presents the basic information on increased (or decreased) property value.

A change in taxable property value can be anticipated from the new industrial development itself (item 38) and from new residential construction built to house new county residents (item 39). These changes in property value are shown for each major taxing authority; in this example, the county and the school district. Please note that in actuality, some of the new houses will very likely be constructed within the boundaries of a city or town. This occurrence can be easily accommodated by following the same procedures to estimate impacts for the city in Tables 6 and 7.

The property value of the new project may be known if it has already been built and assessed. If not, the value of the site, building and equipment can be estimated. Estimates for residential property values must be made based on average home values in the area. Space is left in the table for increases in commercial (item 40) and industrial (item 41) property value, if any.

In this example, the taxable value of the new property is assumed to be $4,500,000. Twenty-five new dwelling units are anticipated. The taxable value of each home is estimated to be $50,000 or a total of $1,250,000 (item 39). Therefore, total additional property value will be $5,700,000 for the school district.

Table 7. Public Sector Impacts

The final table contains information on public sector revenues and receipts. Many simplified assumptions are required to generate these estimates in a pen and pad approach (or for that matter, any approach). Capacity or capital investment decisions and marginal versus average concepts are particularly difficult. An analyst with some experience in impact analysis can replace Table 7 with the comparable table from Ken Clayton's computer model analysis.

Property tax revenue from the new development (item 45) and from any new housing units (item 46) is estimated by applying the current millage rate to the property values from Table 6. The millage rates, which are readily available, are assumed to be 5.50 for the county and 6.00 for the school district in this example. The annual tax revenue from the new plant to the county is, therefore, $24,750 to the county and $27,000 to the school district. Twenty-five new dwelling units are added to the tax roll at a value of $45,000 ($50,000 less an assumed $5,000 homestead exemption). These new houses yield $6,188 in annual property tax revenue to the county and $6,750 to the school district. Thus, total property tax revenue to the county is $30,938 and $33,750 to the school district.

One way of estimating other annual revenue that accrues to a local government is to estimate on a per capita basis and then multiply by the number of new county residents. These additional revenues may come from user fees or state and federal revenue sharing. Many of these sources are, to a degree, population based. Estimates of these revenues can be based on local knowledge or by reference to state summaries of local government financial data.

Total additional annual revenue (item 49) is simply the sum of new property tax revenue (item 47) and new "other" annual revenue (item 48). In the example, other new revenue of $75 per capita for 99 new residents is expected in the county, so the total additional revenue is $38,363 to the county. The school district receives shared state and federal revenue of $325 per student for each of the 20 students or a total of $6,500. Thus, when added to the $33,705 of property tax revenue, total revenue to the school district is expected to increase by $40,250 (item 49).

New expenditures for local government are estimated in a parallel manner. Any capital outlays for physical improvements related to the new industry must be identified and appropriately amortized. Street construction and extension of water and sewer lines are examples of this type of expenditure. Increased spending on fire and police services or municipal refuse collection would also be entered here. Identifying specific, separable cost items associated with the new industry is very difficult. In this example, the total is assumed to be $8,200 per year (item 50).

To estimate additional governmental expenditures related to new population, some per capita figures of government spending are necessary. Marginal figures are desired, but average per capita expenses are usually available. Per capita estimates may be available locally, or they may usually be obtained from a government source on state and local government finance. These publications usually provide expenditures and revenues for units of local government. In Florida, the following seven categories are utilized in the reporting of local government expenditures: (1) public safety, (2) human services, (3) culture and recreation, (4) physical environment, (5) economic environment, (6) transportation and (7) general government services. A previous assumption placed additional county population at 99 (item 12). Assumed per capita expenditures for county services total $190; therefore, new population-related expenditures are an estimated $18,810 (item 50). Assume that per capita student expenditure for each of the anticipated 20 new students is $1,650 or a total of $33,000 (item 51 and also item 52).

Total additional annual expenditures is the sum of the new amortized capital and/or operations outlays for the plant and for additional population. In this case, that figure is $27,010. The difference between total new revenue and total new expenditures is the net surplus or deficit; an $11,353 surplus occurs in the county's annual finances and $7,250 surplus is shown for the school district.

This discussion of Table 7 has centered only on county government. The same process should be followed for city government, the school district and special districts. The final entry for all categories is the existing tax rate in each jurisdiction.

Table 1. Description of Development

Item Number	Item Description	Item
1.	Location of new industry	Example County, Florida
2.	Type of new industry	Baker Products (SIC 1418)
3.	Annual Sales of new industry	$30,000,000

Table 2. Employment Impacts

Item Number	Item Description	Employment*
4.	New direct employment at the plant	300
5.	Jobs filled by outside people moving into the community (new residents)	30
6.	Jobs filled by in-commuters	70
7.	Jobs filled by community residents who formerly were out-commuters	25
8.	Jobs filled by resident workers whose previous position in the community is not refilled	5
9.	Direct jobs filled by existing community residents (item 4 less items 5, 6, 7 and 8)	170
10.	Net new direct employment to existing and new residents (item 5 plus item 9)	200
11.	Indirect and induced employment multiplier (1.00 less total direct, indirect, and induced employment multiplier)	0.60
12.	Indirect and induced employment (item 10 multiplied by item 11)	120
13.	Jobs filled by outside people moving into the community (new residents)	3
14.	Jobs filled by in-commuters	10
15.	Jobs filled by community residents who were formerly out-commuters	6
16.	Jobs filled by resident workers whose previous position in the community is not refilled	2
17.	Indirect and induced jobs filled by existing community residents (item 12 less items 13, 14, 15, and 16)	99
18.	Net new indirect and induced employment to existing and new residents (item 13 plus item 17)	120

Table 2. Employment Impacts (continued)

Item Number	Item Description	Employment*
19.	Total (direct, indirect and induced) net new employment to existing community residents (item 9 plus item 17)	269
20.	Total (direct, indirect and induced) net new employment to existing and new community residents (item 10 plus item 18)	302

*Employment definitions

Direct:	Employment in the new industry.
Indirect:	Additional employment in existing industries due to output demands by new industry.
Induced:	Additional employment to existing industries due to output demands by new residents.

Table 3. Demographic Impacts

Item Number	Item Description	Number
	Residents	
21.	Existing	10,500
22.	Additional	99
	Households	
23.	Additional households	33
24.	Additional housing units	25
	Public School Enrollment	
25.	Additional	20

*Additional residents are estimated as the product of item 5 plus item 9 times average household size.

Additional households are assumed to be the same as the number of new workers (item 5 plus item 9).

Additional housing units are an estimate based on knowledge of the local housing situation.

Additional public school enrollment is estimated as the product of additional residents and the percentage expected to be of school age.

Table 4. Private Sector Impacts: Local Business Sales

Item Number	Item Description	Sales
26.	Direct sales from plant	$30,000,000
27.	Indirect & induced sales (output) multiplier (sales multiplier less 1.00)	0.90
28.	Indirect & induced business sales in the community	27,000,000
29.	Total sales increase in the community	$57,000,000

Table 5. Private Sector Impacts: Personal Income

Item Number	Item Description	Personal Income*
		----Dollars----
30.	Payroll at the plant (direct)	3,000,000
31.	New direct personal income	3,600,000
32.	New direct personal income to existing residents	2,041,000
33.	New direct personal income to residents	2,400,000
34.	Indirect & induced income multiplier	0.80
35.	Indirect & induced	1,920,000
36.	Total new personal income in the community	4,320,000

*Personal income is a specific income concept from the national accounting scheme. In this case, personal income is essentially wages and salaries plus other employee compensation less the employer's share of social security contributions (assumed to be payroll plus 20 percent). New direct personal income to existing residents in the community is the proportion of the payroll to existing residents (item 9 divided by item 4) times new direct personal income (56,770 times $3.6 million). Total new personal income is the sum of new personal income to region residents plus indirect and induced income generated in the region.

Table 6. Taxable Property Value

Item Number	Item Description	City Government	County Government	School District
		------------	Dollars	------------
	Additional Property Value			
38.	New development		1,250,000	4,500,000
39.	Residential		1,250,000	1,250,000
40.	Commercial			
41.	Industrial			
42.	Total Additional		5,700,000	5,700,000

Table 7. Public Sector Impacts: Annual Revenues and Expenditures

Item Number	Item Description	City Government	County Government	School District
		------------	Dollars	------------
	Revenue			
	Property tax revenue			
45.	New development		24,750	27,000
46.	New residential		6,188	6,750
47.	Total		30,938	33,750
48.	Other annual revenue		7,525	6,500
49.	Total additional annual revenue		38,363	40,250
	Expenditure			
50.	New plant		8,200	0
51.	New population		18,810	33,000
52.	Total additional annual expenditure		27,010	33,000
53.	Net surplus (deficit)		11,353	7,250
54.	Property tax millage**			
	Existing rate		5.50	6.00

*Value of residential property is net of $5,000 Homestead Exemption.
**Per $1,000 assessed valuation.

POLICY SIMULATION WITH THE SOUTH CAROLINA IMPACT MODEL

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Introduction

Although many planners in nonmetropolitan areas of the United States are aware of the renewed growth in their communities, it would hardly be surprising if they were unprepared for developing plans to mitigate growth pains. After all, trends persisting until the early 1970s gave every indication that they should instead be devising strategies to combat the problems associated with population loss in their communities. However, growth is now a fact of life in many rural communities, especially in the South and West. For many years, this was the major goal of community leaders. Now that it has arrived, growth must be managed well to maintain the amenities of rural areas that are an important source of that growth. The purpose of this article is to describe the results that can be obtained from a model developed at Clemson and available for use by local officials and planners in South Carolina.

What Fiscal Impact Models Do

Most fiscal impact models essentially assume that a firm has made a decision to locate in a particular area. Given the number of employees, capital investment, assumptions about the socioeconomic characteristics of the new workers, and assumptions about the spatial allocation of the new labor force, then local output, income, employment, and fiscal impacts are calculated (See Figure 1).

The South Carolina fiscal impact model is computerized and thus results from the model are easily obtained within a day's time. However, careful consideration must be given to the required input data. Accordingly, the South Carolina impact model works best when local officials and planners work with researchers at Clemson for a few days to prepare the data concerning local government operating costs for their community.

Why Fiscal Impact Analysis Is Needed

Officials in both declining and rapidly growing areas must make decisions on new and replacement investments to maintain the desired levels of capital stock of sewers, water, roads, schools, etc. Their decisions are based on their perceptions of the future needs of their communities. These perceptions in turn depend on their assessment of economic-demographic change in the area. Because of the long-term financing arrangements for public sector capital, the decisions that they make in a given year will result in a long-term financial burden for the community. Thus, local decision makers must make a concerted effort to estimate economic-demographic changes in their community accurately.

Policy Simulation with the South Carolina Impact Model

Through simulation, location of a new plant can be assumed to be either in or outside the city limits. Local knowledge of available housing can be used to estimate residential location patterns for immigrants. The resulting revenue and expenditure patterns can then be devised to manage growth.

A Case Study

Our case study involves the hypothetical location of a paper products firm in Johnsonville, South Carolina, a rural community of 1500 people. The Johnsonville city planner provided per capita expenditure for various public services. He estimated that no new capital expenditures would be needed and assumed that the new plant would locate in the city limits. The plant would have annual sales of $15,000,000 and directly employ 250 new workers. It was assumed that one-half of the inmigrating direct workers would reside in the city and one-half in the county but outside the city.

Annual public sector economic impacts associated with the new paper manufacturer plant are presented in Figure 2.* Zero values occur in those categories which are not pertinent (e.g., the city of Johnsonville does not incur any cost for public welfare). For Case 1 (no new capital expenditures and firm location in the city) total additional annual revenue of $59,000, $15,000 and $189,900 are generated, respectively, for the city, county, and school district, if the new plant located in Johnsonville. Given the expected total additional annual expenditure, a fiscal NET SURPLUS is projected for the city, county, and school district. If this surplus (or deficit) is extended to all property owners in the respective jurisdictions it would result in a millage decrease of $15.03 per $1000 of assessed valuation in the city, a .002 decrease in the county millage, and a .63 decrease in the school district property tax millage. Alternatively, taxes could be kept at current rates in the city and a subsidy equal to the net surplus could be used to attract the new plant to the city itself.

Figure 3 presents the summary estimates from the following scenarios while assuming that 50 percent of the new direct employees and their families live in the city:

Case 1. The original assumptions described above.

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*Note that the private sector, population and employment impacts are also rountinely found during a model run. These results are not listed here to conserve space. For a full report see South Carolina Impact Model: User's Guide by M. Henry, et al., (Department of Agricultural Economics, Clemson University, Clemson, SC 29631).

Case 2. Let the plant locate in the county but outside the city.

Case 3. Assume city public capital is at capacity for water, sewer and education and the firm locates in the city as described in (1).

Case 4. Assume (3) but let the firm locate in the county.

By comparing the results in Figure 3, the value of simulation with the fiscal impact model is revealed. Assuming that no added public capital will be necessary, the location of the firm either in or out of the city limits results in the city moving from the position in Case 1 of a potential decrease of 14 mills to the Case 3 result of a millage increase of 2.59, all else the same.

Further, if it turns out that new public capital must be purchased, then the city (if it chooses to finance the new capital through tax levies) will have to raise the millage rate. If the firm locates in the city, millage would have to increase by about 4 mills while an out-of-city location implies a city millage increase of over 21 mills. The difference in the millage rate yields an estimate of the cost to current city residents of subsidizing the new capital for new city residents as well as providing for more operating revenues to provide services for all immigrants whether they are city residents (and tax payers) or not.

The community leader could attempt to induce the new firm to locate in the city by demonstrating the benefits of the public services it offers relative to a county location. This obviously would benefit the city residents in either Case 1 or Case 3. Nonproperty tax sources of local revenues might be explored either by a new tax base (sales, income, etc.) or by appealing for more intergovernmental aid (EPA grants, etc.). Knowledge of expected impacts from growth would enhance the ability of a small city to compete effectively for grants-in-aid. In any case, the ability to assess the impact of a new plant in a rural community before the plant is built is a powerful tool for managing community growth.

Figure 1

Basic Components of the S.C. Impact Model, Version 1.1

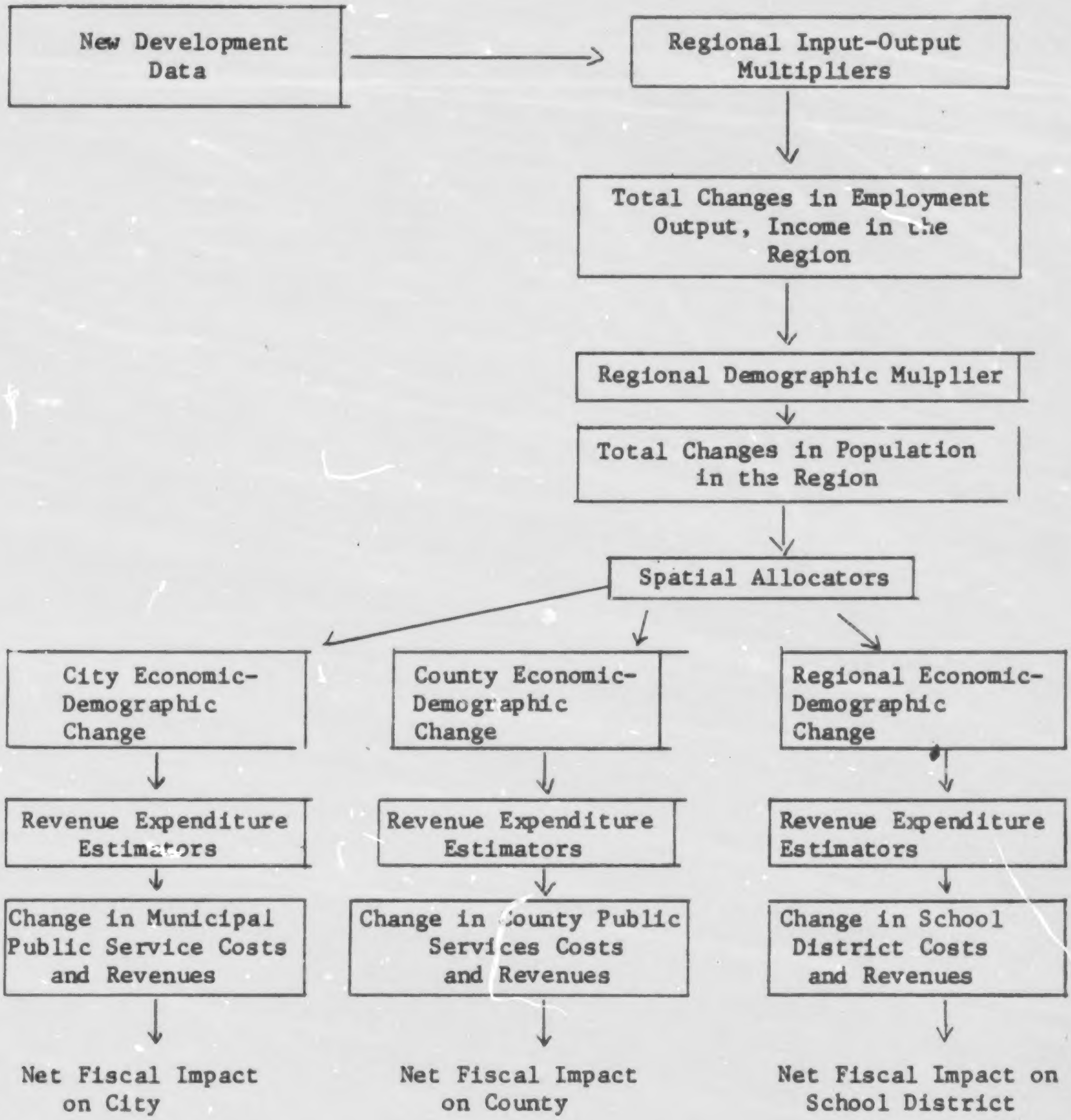
New Development Data
Regional Input-Output Multipliers
Total Changes in Employment Output, Income in the Region
Regional Demographic Mulplier
Total Changes in Population in the Region
Spatial Allocators
City Economic-Demographic Change
County Economic-Demographic Change
Regional Economic-Demographic Change
Revenue Expenditure Estimators
Revenue Expenditure Estimators
Revenue Expenditure Estimators
Change in Municipal Public Service Costs and Revenues
Change in County Public Services Costs and Revenues
Change in School District Costs and Revenues
Net Fiscal Impact on City
Net Fiscal Impact on County
Net Fiscal Impact on School District

Figure 2. Economic Growth Impact Analysis: Public Sector Impacts.

	City	County	School
	Dollars		
Revenue			
Property Tax Revenue*			
New Development	17325.	0.	36225.
Residential	7364.	9485.	23208.
Commercial	166.	189.	463.
Industrial	1469.	0.	30719.
Total	26324.	9674.	90615.
Public Service Charge	28730.	326.	-
Intergovernmental			
Federal	2245.	4285.	25196.
State	2511.	1223.	74073.
Local	0.	0.	0.
Total	4756.	5508.	99269.
Extra Annual Revenue	0.	0.	0.
Total Additional Annual Revenue	59809.	15508.	189884.
Expenditure			
Operating			
General Government	2152.	4596.	-
Police	6667.	1851.	-
Fire	898.	32.	-
Other Public Safety	121.	111.	-
Streets & Highways	0.	1877.	-
Parks, recreation & Nat. Res.	0.	418.	-
Health & Hospital	392.	1176.	-
Public Welfare	0.	4240.	-
Refuse & Trash	4707.	799.	-
Sewage	17223.	0.	-
Utilities	10049.	0.	-
Misc. Expenditures	1046.	591.	-
Total Operating Expenditures	43254.	15692.	142548.
Capital Outlay	0.	0.	0.
Annual Debt Service	0.	0.	0.
Extra Annual Expenditures	0.	0.	0.
Total Addition Annual Expenditures	43254.	15692.	142548.
Net Surplus (Deficit)	16555.	-184.	47336.
Property Tax Millage**			
Existing Rate	55.0000	47.0000	115.0000
All Property Differential	-14.0412	0.0024	-0.6258

*Value of industrial property is exempt from county property taxes.

**Per $1000 assessed valuation.

Figure 3. Simulation Results for Johnsonville, South Carolina. Fiscal Impact Analysis: 50 Percent New Residents in City.

	Case 1	Case 2	Case 3	Case 4
Change in Revenue:				
City	$59,139	$28,398	$59,139	$28,398
County	15,508	15,508	15,508	15,508
School District	189,884	189,884	189,884	189,884
Change in Expenditure:				
City	42,644	30,444	63,896	45,616
County	15,692	15,692	16,215	16,215
School District	142,548	142,548	171,859	171,859
Net Surplus:				
City	16,494	-2,046	-4,758	-17,218
County	-184	-184	-706	-706
School District	47,336	47,336	18,025	18,025
Property Tax Millage:				
Existing				
City	55	55	55	55
County	47	47	47	47
School District	115	115	115	115
All Property				
Differential:				
City	-14.03	+2.59	+4.05	+21.84
County	-.002	+.002	+.009	+.009
School District	-.63	-.63	-.238	-.238

THE TEXAS ASSESSMENT MODELING SYSTEM (TAMS): A METHODOLOGY FOR PROJECTING SOCIOECONOMIC IMPACTS OF LIGNITE DEVELOPMENT IN RURAL TEXAS

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Lignite development is becoming of increasing importance to the State of Texas. As other energy resources are exhausted and as energy prices increase, Texas lignite is expected to provide an increasingly larger proportion of the state's energy needs, particularly in the generation of electricity. The state's lignite resources are estimated to consist of 12.2 billion tons of strippable lignite (Kaiser, 1978) in addition to over 100 billion tons of deep basin lignite (Governor's Energy Advisory Council, 1974). Texas' lignite production has increased from 2 million tons in 1970 to 15 million tons in 1977 (Kaiser, 1978). Total production is expected to exceed 50 million tons per year by 1985 (Kaiser, 1978) and a number of large scale power projects are projected for construction in the next few years.

The impacts of these developments are likely to occur primarily in rural areas and are expected to affect many relatively small communities (Murdock, et al., 1979a). The communities are likely to experience a large number of changes as a result of lignite development. These may include such long-desired changes as increases in business activity, tax revenues, employment and population; but also less desirable changes such as increases in public service demands and costs, increased traffic and congestion, changes in air and water quality, increased levels of crime, and an altered way of life for many community residents. Whether the changes provide largely opportunities or problems for rural communities depends to a large extent on whether they have been accurately anticipated by local public and private officials. To effectively plan for the socioeconomic impacts of such developments, these officials must have answers to such questions as: (1) How many new jobs will be created as a result of the development?; (2) How many people will come to my community as a result of the development?; (3) How many new housing units and what types of units will these new persons desire?; (4) What are the types of services most likely to be negatively and positively impacted by such a development?; (5) What level of new revenues and expenditures are likely to be created by such developments and will public revenues equal the public costs resulting from such a development?; and (6) How will such a development affect the way of life and the quality of life in my community?

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The purpose of this paper is to describe the method by which information needed to address these questions is being provided to local leaders in the areas of Texas being impacted by large lignite developments. First, a brief description of the dimensions that must be addressed when attempting to project socioeconomic impacts is presented. Then, a computerized socioeconomic impact projection system developed by researchers in the Department of Agricultural Economics and Rural Sociology at Texas A&M University, the Texas Assessment Modeling System (TAMS), which seeks to provide projections that address the major socioeconomic issues in impacted areas is described.

Dimensions in Socioeconomic Impact Projections

The nature of the socioeconomic impacts likely to occur in a rural area as the result of a lignite development, such as the construction and operation of a coal-fired electric generating facility, are largely the product of the interaction of three general factors: (1) those related to the characteristics of the project; (2) those related to the baseline characteristics of the area; and (3) those related to the characteristics of the new workers that move to rural areas as a result of such developments. Lignite developments tend to be quite large relative to most other rural industrial developments and the socioeconomic impacts are generally spread over several communities within the impact area.

Hence, the type of project (coal mine, lignite-fired electric generating facility, imported coal-fired electric generating facility, etc.), the exact geographical location of the project, the number of workers required by the project in both its construction and operational phases, the length of the construction and opertional phases of the project, the expected expenditures of the facility within the local area, and the developer's policy toward hiring and training local persons will all affect the magnitude of impacts on an individual community. Thus, projects that are close to a community, that require large work forces for both construction and operational phases, that have expedited construction schedules, that expend a large part of project costs in the local area, and that hire predominantly non-local persons are likely to have larger impacts (both positive and negative) for a community than projects farther away and lacking these characteristics. Impact projection methodologies must take into account such key projection characteristics as: (1) location; (2) work force size during various project phases; (3) length of project phases; (4) level of project expenditures in the local area.

In addition, project impacts are affected by a number of impact area characteristics. These characteristics include the number of local persons with the necessary skills that are available to take project-related employment, the level of development of the area's services and businesses, the prevailing revenues, expenditures and other fiscal patterns in potential settlement areas and the range of alternative settlement areas. In general, the large the number of local workers available for employment in the area, the smaller the number of new (non-local) workers needed and the less dramatic the magnitude of impact. Also, the greater the level of development of local services and the more positive the area's fiscal picture, the more able the area is to absorb impacts. Finally, the greater the number of alternative settlement sites for new workers, the less likely impacts are to be concentrated or extensive at any one site. Impact projection models must asses: (1) the likely level of local employment at the project; (2) the level of present services and fiscal bases; (3) the likely overall attractiveness of local settlement areas.

Finally, the characteristics of those non-local workers that move to impact areas must be taken into account. The family size and other characteristics (demographic characteristics) of these workers, their settlement preferences, perspectives, and service preferences and requirements will affect the magnitude, location and types of impacts. Impact projections must assess: (1) non-local worker characteristics (including those of their families); (2) non-local worker settlement patterns; (3) non-local worker service preferences, demands, and requirements.

Only if the characteristics of the project, the area, and new workers are correctly estimated and correctly interrelated will projections of impacts accurately reflect the actual impacts. Clearly, the range of dimensions that must be examined in socioeconomic impacts is extensive, and the task of projecting such impacts is a challenging one. Only with such projections, however, can the planning needs of private and public decisionmakers be satisfied.

The Texas Assessment Modeling System

Prior to the development of the Texas Assessment Modeling System (TAMS), there existed no comprehensive methodology for providing information that could address the various dimensions of socioeconomic impact associated with large scale lignite developments in a timely, flexible and accessible manner. A thorough review of models used in socioeconomic impact analysis led to the conclusion that among the most widely used and sophisticated of such models were the North Dakota Regional Environmental Assessment Program's Red I and Red II Models (Markusen, 1978). These models have been widely used by state and local private and public decisionmakers in North Dakota for several years.

Given the characteristics of the North Dakota model and its proven utility, researchers at Texas A&M determined that its adaptation to the Texas lignite area would provide a useful assessment tool for the State of Texas. This model was adapted to the lignite area of East Texas during 1978 and 1979 under sponsorship from the Center for Energy and Mineral Resources, the Texas Agricultural Experiment Sation, and the

Texas Agricultural Extension Service. It is fully operational and available for use within a 53 county area for assessing the socioeconomic impacts of a variety of lignite-related developments. Its characteristics are described below and a more detailed description is available in sources available on request from the authors (Murdock, et al., 1979b, and 1979c).

The Texas Assessment Modeling System (TAMS) is based on an extensive local area data base, provides rapid turnaround time, allows the user to examine the implications of numerous alternative scenarios with relative ease, and provides projections at a variety of geographical levels for each year during a project's development. TAMS addresses each of the major socioeconomic dimensions described above and is currently being expanded to include an environmental module to examine effects on air and water quality and land use. Finally, it is organized in an administrative structure that insures direct and continuous interaction between users and model developers.

The Texas Assessment Modeling System is a fully computerized interactive socioeconomic projection system. It provides projections of economic, demographic, public service and fiscal conditions for each county, each city, and each school district in a designated impact region for a 25-year planning horizon. It is presently available for use in a 53 county area in East Texas (see Figure 1). The model can project impacts in a large number of socioeconomic dimensions, for each of the six regions, 53 counties and over 300 cities and school districts in the project area, and can do so while providing the user with a large number of directly alterable parameters and reporting options.

Model Structure

The model's structure is composed of six basic components:

1. An Economic Input-Output Module
2. A Cohort-Survival Demographic Module
3. An Economic-Demographic Interface Module
4. A Residential Allocation Module
5. A Service Requirements Module
6. A Fiscal Impact Module

A generalized flow diagram of the model is presented in Figure 2.

As indicated in Figure 2, the economic module is used to estimate the level of business activity for each economic sector required to satisfy a specified level of sales to final demand. Employment requirements by sector and development phase are then derived from the estimates of business actvity. The demographic module provides projections of population by age and sex and an estimate of the available labor force. The interface component links the projections of required employment from the economic module with the projections of available employment from the demographic module to determine the level of employment needs that can be met by the indigenous population and those that must be met by the inmigration of new workers. The residential allocation module estimates the settlement patterns of new workers and their families and the service requirements module provides projections of the increased service needs associated with population growth. The fiscal impact module provides projections of the expected changes in public sector costs and revenues resulting from the economic and demographic changes. The various modules operate differentially at the regional, county, and municipal levels.

Model Outputs

Outputs are available as selected by the individual user at the regional, county, and municipal levels for each year during the project period and include:

1. Business activity (summation of business and industry sales)
2. Personal income (total)
3. Employment by type (non-project and project-related types)
4. Population (total)
5. Population by age and sex
6. Housing demand by type (single family, mobile home, multiple family and other)
7. School enrollments by grade level
8. Criminal justice services requirements (number of policemen required, offenses, etc.)
9. Medical service requirements (number of doctors, hospital beds, etc.)
10. Public sector costs by type of service
11. Public sector revenues by revenue source
12. Net fiscal balance.

Reporting Options

The model provides several user reporting options. Among the reports than can be selected are:

1. Regional Economic Activity Report: Provides information on regional levels of business activity and personal income and numeric and percentage change in these from year to year for baseline and project-related impacts.

2. County Employment Summary Report: Provides information on county employment for baseline agricultural and non-agricultural employment and project-related energy and non-energy operational, construction and indirect employment types and numeric and percentage changes in these from year to year.

3. Municipal Employment Summary Report: Identical to County Employment Summary, but provides data for each municipality.

4. Regional Population Summary Report: Provides data on total population and employment by type (see County Employment Report) and numeric and percentage changes in each from year to year.

5. County Population Summary Report: Identical to the regional report, but data are provided for each county.

6. Municipal Population Summary Report: Identical to the regional report, but data are provided for municipalities.

7. Population by Age and Sex Report: Provides data on population by single or 5 year age groups for males and females (for counties only).

8. Housing Report: Provides data on number of single family, multiple family, mobile home and other housing units required.

9. School Enrollment Report: Provides data on primary and secondary school enrollment (available for counties and school districts).

10. Criminal Justice Report: Provides data on total offenses, crimes by type (violent, property, juvenile, other), number of new officers and police vehicles required (for regions only).

11. Medical Services Report: Provides data on number of physician visits, number of persons hospitalized, number of patient days, number of doctors required, number of hospital beds required (for regions only).

12. County Fiscal Impact Report: Provides data on public sector costs, revenues and net fiscal balances (in dollars).

13. Municipal Fiscal Impact Report: Identical to county report only fiscal variables are for municipalities.

14. School Fiscal Impact Report: Identical to county report only fiscal variables are for school districts.

User-Alterable Parameters

The user may also alter several key model parameters if so desired. These include:

1. the region of interest
2. projection period (range of years)
3. projects of interest
4. for each project
    a. project location
    b. construction start data
5. gravity powers (for population distribution)
6. unallocated labor pool values
7. community attractiveness
8. birthrate (1.8, 2.1 or 2.5)
9. inflation rate
10. sales and use tax rates

The model thus provides a wide range of outputs, reporting forms and user-alterable variables. As such, it provides a highly flexible planning mechanism.

Model Administration and Use

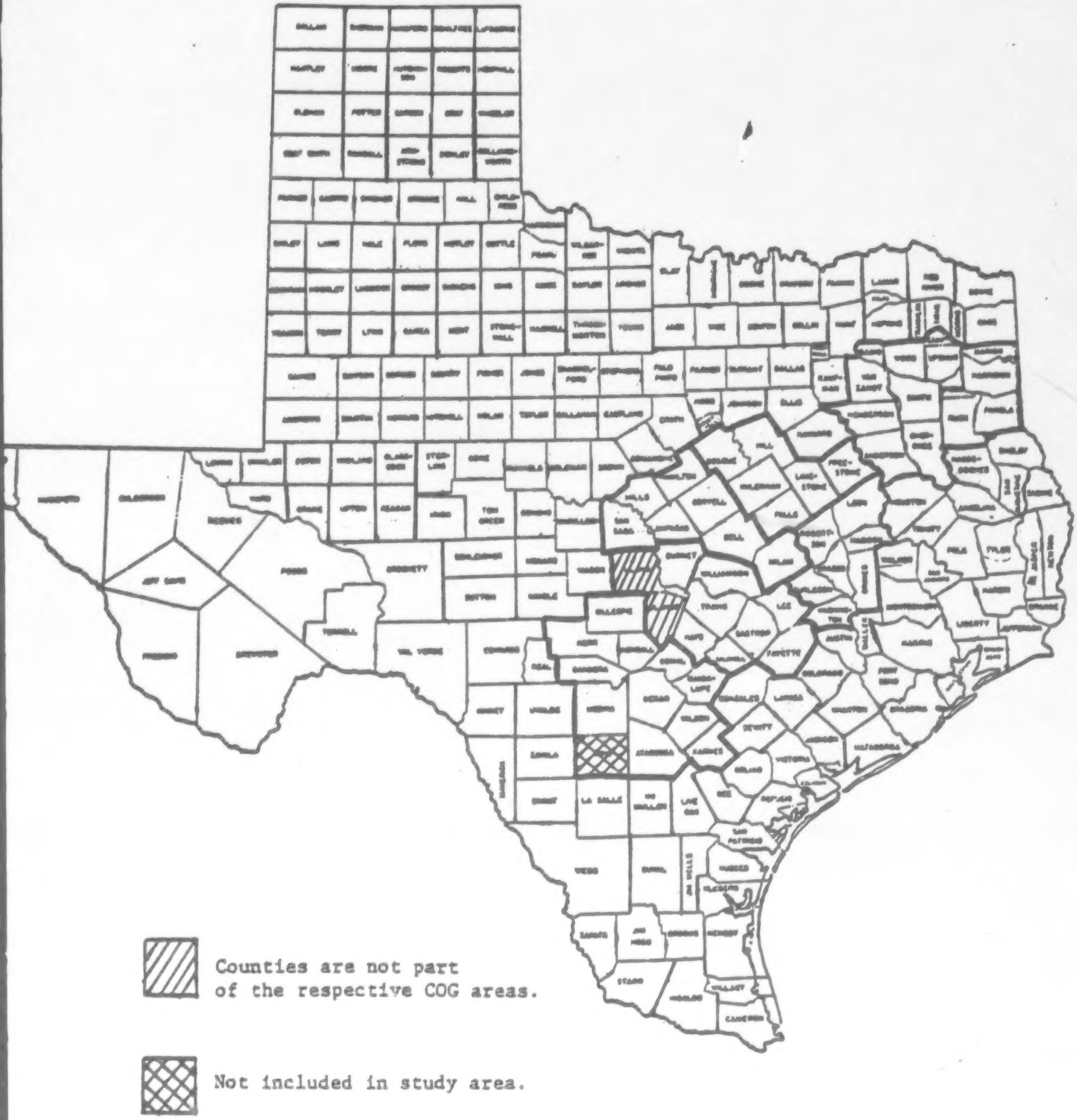
Projections from the model can be obtained by any private or public entity in the State of Texas. Manuals describing model use are available from the Center for Energy and Mineral Resources, the Departments of Rural Sociology or Agricultural Economics in the Texas Agricultural Experiment Station and the Community Development Program in the Texas Agricultural Extension Service.

In general, two modes of use are provided. The user can choose to use any of several general types of projects already included in the model and assess the general effects that such a project would have in their area or one can use the model to assess the impacts of a specific project. In either type of use, members of the model development team are availble to work with the user in specifying the type of model runs desired.

Costs for using the model include only costs for data set up and computer processing time, but in most cases, these costs are relatively low compared to alternative means of obtaining such impact projections. In all cases, Texas A&M retains the right to make public all model results deemed significant for public use and essential for public decisionmaking.

The model developers at Texas A&M have found that the Texas Assessment Modeling System has proven to be a useful tool for state and local decisionmakers. Plans to extend the geographical coverage area of the model and its projection capabilities are in progress and several entities are presently using the model's results to determine public facility impacts.

Figure 1. AREAS INCLUDED IN TEXAS ASSESSMENT MODELING SYSTEM


▨ Counties are not part of the respective COG areas.
▩ Not included in study area.

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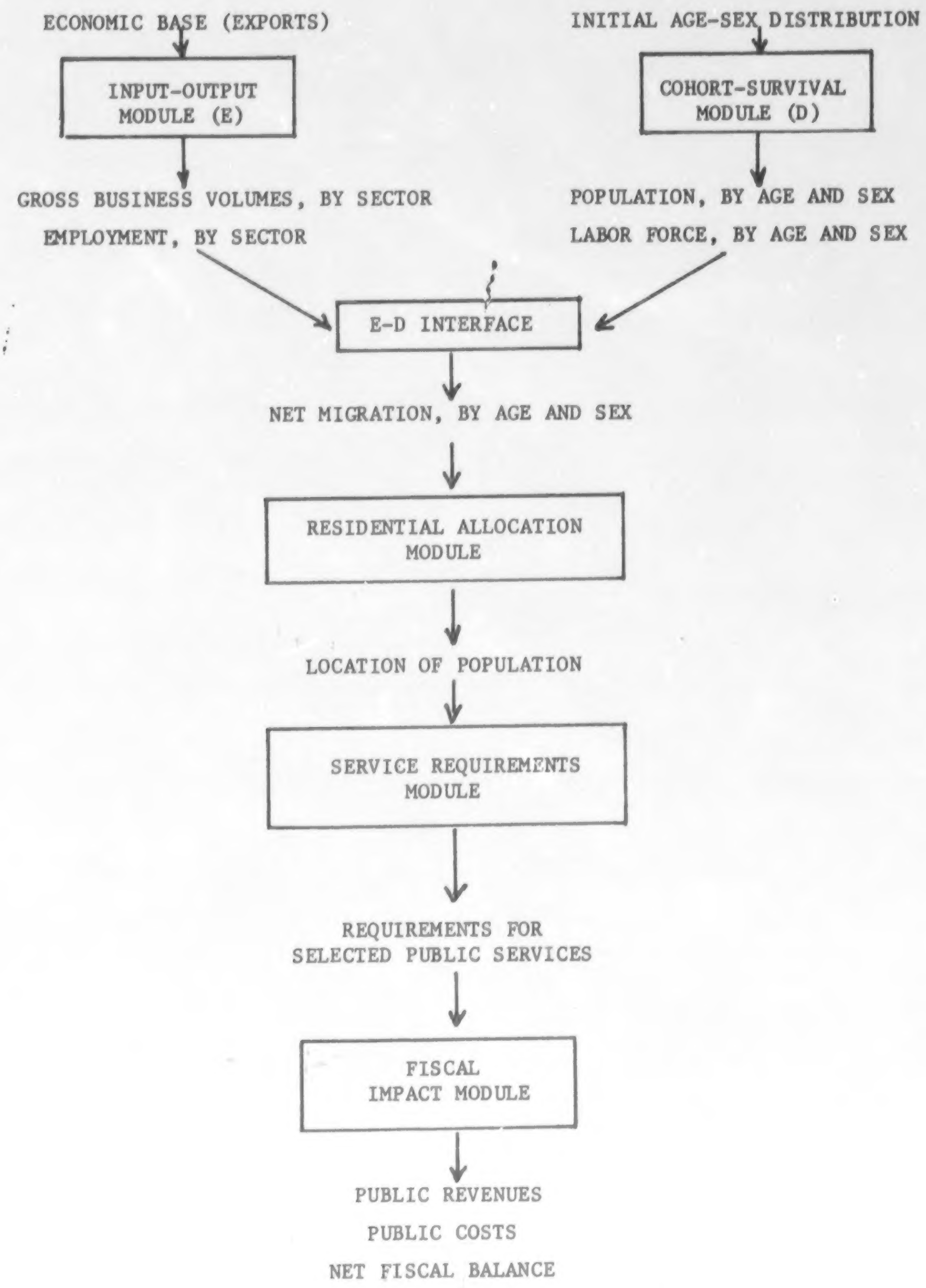
ECONOMIC BASE (EXPORTS)
INITIAL AGE-SEX DISTRIBUTION
INPUT-OUTPUT MODULE (E)
COHORT-SURVIVAL MODULE (D)
GROSS BUSINESS VOLUMES, BY SECTOR
EMPLOYMENT, BY SECTOR
POPULATION, BY AGE AND SEX
LABOR FORCE, BY AGE AND SEX
E-D INTERFACE
NET MIGRATION, BY AGE AND SEX
RESIDENTIAL ALLOCATION MODULE
LOCATION OF POPULATION
SERVICE REQUIREMENTS MODULE
REQUIREMENTS FOR SELECTED PUBLIC SERVICES
FISCAL IMPACT MODULE
PUBLIC REVENUES
PUBLIC COSTS
NET FISCAL BALANCE

Figure 2. DATA AND OUTPUT FLOWS OF TEXAS ASSESSMENT MODELING SYSTEM

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A USER-ORIENTED COMPUTERIZED FISCAL IMPACT MODEL

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Small towns and rural communities often promote industrial development as a means of strengthening their local economy. Attracting a new industry or expansion of an existing industry creates new employment opportunity and raises local income levels. The local tax base may be strengthened, and improvement in the town's net fiscal position is often cited as a major advantage of a new industry (Reinschmiedt, et al., 1978). However, statistics presented in support of industrializaton may reveal only the gross benefits of industrial development in terms of total numbers of employees, total payroll, gross value of output, and similar aggregate data.

Towns and cities may overstate industrial benefits and understate added costs for several reasons. These include: (1) some of the plant's payroll leaks out of the community through commuters; (2) multiplier effects are smaller than expected because residents tend to consume outside the community; (3) local government is unable to convert economic growth into tax revenues by giving too many concessions to new industry; and (4) increased demand for community services (thus increased costs) are not fully considered. Hence, negative fiscal impacts may be underestimated.

In the past several years much effort has been devoted to developing impact models for estimating internalized benefits and costs from the location of industry within or near a rural community (Clayton and Whittington, 1977, Shaffer and Tweeten, 1972). This type of model is one form of impact assessment tool used by community planners to anticipate growth and needs for the future (Runyan, 1977). The industrial impact model presented herein is a partial budget tool analyzing the first full year of plant operation. Impacts are measured in terms of net dollars gained or lost. The fiscal implications of economic development are an important source of planning information. The purposes of this paper are to list important issues in fiscal impact planning and to report on experiences with the model used as a planning tool.

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Overview of Industrial Impact Model

Most of the data required for this analysis is requested from local sources to utilize as much community-specific information as possible. Where local information is not available, the model resorts to internal "default" coefficients previously estimated from industrial impact research in Texas (Reinschmiedt, 1976). The model is similar to earlier work developed by Shaffer and Tweeten in Oklahoma (1972). However, county impacts are included, and the model is computerized for use by rural Texas communities. By using a computer to estimate the impacts, efficient and timely results can be provided when the model is needed, and repeated runs can be made at low cost based on different assumptions. The model's characteristics and an example application are discussed in the remainder of this paper and a more detailed description is available from the authors.

The model provides impact estimates specifically for the local area requesting the information. Hence, estimated benefits and costs for each sector are discounted for leakages from the local area to other areas. Such leakages occur for both primary and secondary benefits as a result of such factors as: (1) income losses through social security payments, (2) wages and salaries paid to in-commuters, (3) consumer expenditures made in areas other than the local community, and (4) plant purchases of inputs from outside the community.

Income multipliers are used to estimate all of the secondary benefits and costs resulting from initial investments by industries in the study communities. Regional input-output multipliers were modified, using information from survey data, by adjusting indirect and direct effects to reflect that proportion of regional impact that is retained with the host study area (Grubb, et al., 1972). Twenty-two separate income multipliers, each relating to a specific industry type, are included within the model.

All fiscal estimates are annualized and based on the first year of full employment operation of the industrial plant. Discounting equations are utilized to amortize investments made by various sectors that extend over a period of years.

Estimated Costs and Benefits

The marginal benefits and costs from a new industry are estimated for the private, municipal government, school district, and county government sectors of the local area economy. Direct, indirect, and induced effects are estimated for both benefits and costs to determine the net economic impact on each sector. As an example the value of each estimate discussed below is derived from an application of the model to estimate impact of a proposed uranium plant near a South Texas town of about 8,000 in population. These results are presented in Tables 1-5. All values are in 1980 dollars.

Private Sector

An estimate of total plant wages and salaries paid during the first year of full employment operation of the plant are obtained from industry officials. Total direct benefits to the local community are estimated subtracting out social security and federal income tax payments and then discounting total disposable income by the propensity of employees to spend within the local community and by the percentage of income paid to employees who reside outside the study area. The direct private benefits are low for this example because of a high percentage of employees who will be commuting outside the area. The nature of the industry under study requires a specialized labor force, and several large cities are within reasonable driving distance of the project. Indirect and induced income benefits are estimated through the use of the sector multiplier.

Private sector direct costs include the values of location incentives provided by the sector, income losses from plant employees whose previous jobs went unrefilled, or reduced income flows to the community if employees had previously received public assistance payments (Shaffer and Tweeten, 1972). Indirect and induced private sector costs are estimated as the product of total direct costs times a community income multiplier of 1.55. Private sector net gain or loss is the difference between total private sector benefits and total private sector costs.

Municipal Sector

Estimated Benefits: Benefits accruing to the municipal government include: (1) property tax revenues from the industry and new residents, (2) sales tax revenues resulting from the plant payroll, and (3) municipal service revenues from increased economic activity. Property values already on the tax rolls do not represent a gain in the tax base of the community. Likewise, the only property tax revenues generated by the plants that move into existing buildings are from plant equipment and personal property. Municipal property taxes are estimated as the products of the municipal tax rate times the value of plant investments and the estimated investments in new homes resulting from the development.

While property taxes represent a significant portion of the new industry's impact on municipal government, other tax revenues and charges are also important. Income subject to sales tax is estimated by multiplying the community's internalized income by the proportion which is subject to sales taxes. Based on the Bureau of Labor Statistics Consumer survey, 35 percent of an individual's disposable income is assumed to be spent on items generating sales tax revenue. This figure is multiplied by the local 1 percent sales tax rate to determine the tax revenue generated.

Utility service fees paid to municipally owned utilities are estimated for both the newly established plant and residences. In most cases utility revenues make up the bulk of municipal benefits. Other revenues are estimated from historic per capita revenue times the estimated number of new residents.

Local government benefits include the multiplier effect related to the increased level of direct income. To estimate these multiplier effects, the respective revenue categories of the municipal budget are expressed on a per dollar of community personal income basis. Indirect and induced budget effects are calculated by multiplying these figures by the total indirect and induced income from the new development.

Estimated Costs: Costs to the municipal government include: (1) cost of utilities to the plant and to new residents, (2) cost of municipal services, (3) cost of services consumed by in-commuters, (4) location incentives or subsidies extended to industry, and (5) indirect and induced expenditures from increased demand on public services.

The municipally owned and operated utilities incur costs for supplying services to the new plant and new residents. Also, municipal government incurs expenses for police, fire protection, street maintenance, utilities, and other city services. To estimate the costs of these services to new residents, community budget expenditures less utility expenditures are expressed as a per capita cost coefficient. A third direct cost arises when in-commuters take jobs at the plant. These workers consume municipal government services, but do not pay taxes or otherwise contribute to the cost of providing these services. Costs attributed to in-commuters are estimated on the basis of a fraction of the time spent at work in the community.

Expansion of water, sewer, gas, electric, street, other facilities, and services also represents a direct cost to the community if these are not paid for directly by the individuals or firms to whom the services are extended. Extending services at no charge to the industry represents a form of subsidy if the forthcoming net revenues are not sufficient to cover these costs. Even if the plant generates enough revenue to make it feasible for the community to extend services, annual principal and interest payment on capital invested by the community is a direct cost to the community.

School District Sector

The analysis of the school district sector follows the same logic as that for the municipal sector with modifications relating to sources of revenue and types of costs.

Estimated Benefits: School district direct benefits include: (1) property taxes levied against the new industry and new homes, (2) state and federal aid transfers for new students associated with industry, and (3) indirect and induced revenues from increased economic activity.

In Texas, a funding formula determines the amount of non-local funding which the school district receives. To obtain the industrial impact estimate, non-local contributions per average daily attendance are multiplied by the estimated number of school-age children of new residents connected (directly or indirectly) with a new plant. Indirect and induced benefits include all additional revenues paid to the school district in the form of taxes, transfers, fees, and other sources by new residents and businesses other than those resulting from the plant and its employees directly.

Estimated Costs: Costs to the school district from new industry are: (1) instructional expenditures for new students, (2) capital outlays and debt expense resulting from facility expansion, and (3) indirect and induced expenditures caused by increased demand on educational services.

Educational expenditure increases other than teacher salaries and capital outlays (supplies, etc.) are estimated by multiplying the number of new students by the average cost per student. Costs for new teachers are estimated as the product of the estimated number of new teachers required times the average costs per teacher. If new capital outlays are required, the cost of these is estimated from the magnitude of the expansion and the cost of new construction and facilities. Frequently in rural school districts, excess capacity in the school plant exists and moderate additions of new students can be made without requiring new facilities or teachers.

County Government Sector

Sources of revenue for the county government sector are similar to those of the municipal government and school district sectors. They include (1) miscellaneous revenues from new residents such as licenses, fees, etc., (2) ad valorem taxes on the new industry and homes, and (3) indirect and induced benefits. Primary costs to the county government from the new industrial plant and its employees are for law and fire protection, health facilities, welfare, and highways.

Summary of Results

Tables 1-5 present the model results of a proposed uranium plant with 251 new jobs locating in a South Texas town of 8,000 residents. The overall net gain to the community ranged from a low estimate of \$2,198,160 to a high of \$2,395,861 (Table 1). These low-to-high estimates are based on user-supplied information about the expected range of wages, new homes built, new residents, and new school children. The greatest share of this net gain is retained within the private sector. The school and county sectors are also estimated to benefit while the municipal government sector experiences a much smaller net gain. The municipal government experiences a low net gain because the plant is not located within city limits, thus there are no tax revenues received directly from the industry. These results are not atypical from those of numerous applications in rural Texas communities for the school and other public sectors.

Concluding Remarks

The location or expansion of industry generates both economic benefits and costs for a community. Net gains to the community must consider leakages in the income flow, costs of improving community services, and the magnitude of business investment. The above analysis is designed to use as much local user information as is feasible and to provide impact estimates that are easy to understand by the users with limited training in economics. The computer model provides low, intermediate, and high projections to provide selective comparisons for the user. It is also designed for application in relatively small community situations where impacts may be overestimated easily using conventional methods such as export base or input-output models. Results generated from some 150 applications to date indicate that it is successful in providing useful planning information for local community leaders.

It has been found that overall community benefits exceed costs in all applications of the model in rural Texas communities. Typically, the private sector captures the largest share of the community net gain while the municipal government, school district, and county government sectors gain less, often only break even, or may suffer a net loss. The net gain or loss of the public sectors is quite sensitive to the magnitude of taxable investments made by the industrial plant with in their jurisdiction. Hence, net benefits in terms of tax savings to the indigenous population from industrialization may be quite limited.

Table 1. General summary of benefits, costs and net gain (loss) to the community economy; case study of a Texas uranium plant, 1980.

	Low Estimate	Inter. Estimate	High Estimate
Private Sector			
Benefits	$1,011,073	$1,130,023	$1,235,756
Costs	2,359	5,924	9,488
Net Gain (Loss)	1,008,715	1,124,100	1,226,268
Municipal Government			
Benefits	$ 310,866	$ 325,319	$ 338,167
Costs	223,422	236,902	248,884
Net Gain (Loss)	87,443	88,417	89,283
School District			
Benefits	$ 911,452	$ 918,403	$ 924,581
Costs	209,001	226,985	242,971
Net Gain (Loss)	702,451	691,418	681,610
County Sector			
Benefits	$ 435,066	$ 438,793	$ 442,107
Costs	35,515	39,693	43,407
Net Gain (Loss)	399,551	399,100	398,699
Community			
Total Benefits	$2,668,458	$2,812,539	$2,940,611
Total Costs	470,297	509,504	544,750
Net Gain (Loss)	2,198,160	2,303,035	2,395,861

Table 2. Estimate of the benefits, costs, and net gain (loss) of the private sector; case study of a Texas uranium plant, 1980.

Benefits			
Total Plant Wages and Salaries	$8,276,400		
Total Disposable Wages and Salaries	6,414,210		
Total Direct Benefits		$ 432,959	
Total Indirect and Induced Benefits		697,064	
Total Private Sector Benefits			$1,130,023
Costs			
Private Sector Location Incentive Costs	0		
Direct Income Lot from Unrefilled Jobs and Public Assistance	$ 56,618		
Total Direct Costs to Community		$ 3,822	
Total Indirect and Induced Costs		2,102	
Total Private Sector Costs			$ 5,924
Private Sector Net Gain (Loss)			$1,124,100

Table 3. Estimate of the benefits, costs, and net gain (loss) of the municipal government sector; case study of a Texas uranium plant, 1980.

Benefits			
Ad Valorem Taxes - New Industry	$ 0		
Ad Valorem Taxes - New Homes	115,200		
Sales Tax Revenues	1,515		
Utility Revenues - New Plant	0		
Utility Revenues - New Homes	0		
Misc. Revenue - New Residents	72,809		
Total Direct Benefits		$189,524	
Indirect and Induced Property Taxes	$ 9,574		
Indirect and Induced Sales Taxes	8,148		
Indirect and Induced Misc. Revenues	118,073		
Total Indirect and Induced Benefits		$135,795	
Total Municipal Sector Benefits			$325,319
Costs			
New Utility Expenditures - New Plant	$ 0		
New Utility Expenditures - New Homes	0		
Expenditures on New Residents	78,966		
Expenditures on In-Commuters	29,878		
Location Incentive Costs	0		
Foregone Ad Valorem Revenues	0		
Total Direct Costs		$108,844	
Total Indirect and Induced Costs		128,058	
Total Municipal Sector Costs			$236,902
Municipal Sector Net Gain (Loss)			$ 88,417

Table 4. Estimate of the benefits, costs, and net gain (loss) of the school district; case study of a Texas uranium plant, 1980.

Benefits			
Ad Valorem Taxes on Net Industry	$780,000		
Ad Valorem Taxes on New Homes	23,040		
Federal and State Aid Transfers	49,335		
Total Direct Benefits		$852,375	
Total Indirect and Induced Benefits		66,028	
Total School Sector Benefits			$918,403
Costs			
Net Student Costs	$ 56,139		
Foregone Ad Valorem Revenues	0		
Total Direct Costs		$ 56,139	
Total Indirect and Induced Costs		170,846	
Total School Sector Costs			$226,985
Net School District Gain (Loss)			$691,418

Table 5. Estimate of the benefits, costs, and net gain (loss) of the county government sector; case study of a Texas uranium plant, 1980.

Benefits			
Ad Valorem Taxes on New Industry	$387,900		
Ad Valorem Taxes on New Homes	4,800		
Misc. Revenue - New Residents	10,684		
Total Direct Benefits		$403,384	
Total Indirect and Induced Benefits		35,409	
County Sector Benefits			$438.793
Costs			
Costs for Law and Fire Protection	$ 0		
Costs for Health Facilities	0		
Change in Welfare Spending	0		
Costs for Highways	0		
Total Direct Costs		$ 0	
Total Indirect and Induced Costs		39,693	
Total County Sector Costs			$ 39,693
Net County Sector Gain (Loss)			$399,100

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A COMMUNITY LEVEL SIMULATION MODEL FOR RURAL DEVELOPMENT PLANNERS

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During the '70s, for the first time in 160 years, rural areas and small towns had a higner growth rate than metropolitan communities. Preliminary 1980 census figures indicate that nonmetropolitan counties increased by about 15 percent whereas metropolitan counties increased by about 9 percent from 1970 to 1980 (1). Many mining, resort-retirement and urban fringe counties grew by 40 to 50 percent or more. On the other extreme, nearly 500 of the 2,485 nonmetropolitan counties continued to decline in population during the 1970s (10).

Decisionmakers in rapidly growing communities are under severe pressures to plan for growth. Planning community services often entails large capital outlays, and thus, it is important to base plans on available employment, income and population information. Building a water or sewer treatment plant too large or too small can be a very expensive and embarrassing mistake for elected officials. Similarly, decisionmakers in declining or stagnating rural areas need to properly plan so that their scarce resources are efficiently allocated.

Extension personnel can aid local decisionmakers with a locally applicable community impact model. The objective of this paper is to illustrate how Extension professionals can utilize community impact models. More specifically the objectives are:

1. to review several community impact modes
2. to illustrate the application of a community impact model
3. to discuss the Extension challenge of deliverying community impact models.

The Research Challenge

Impact models describe economic and demographic changes which affect both the public and private sectors. Estimated impacts of rapid growth or decline represent useful information for community decisionmaking. Most impact models are ex ante in nature, providing projections before the impact occurs. The alternative is ex post impact analysis

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which describes the impact after it has occurred. With shifting populations, economic changes and energy development, reliable ex ante impact models are increasingly useful.

Brief Review of Some Impact Models

Many types of models and methodologies have been developed. These range from economic base analyses to complicated community simulation models. Shaffer and Tweeten (11) present an early version of an impact model developed to measure the impact of new industry on rural communities in Oklahoma. The model provides results of private impacts, public sector impacts and school district impacts. A framework for calculating net gain (loss) to the community was also included in order to estimate reasonable "inducement" levels that communities might offer potential manufacturing employees. The model is notable because of the emphasis placed on making it usable and understandable to local leaders. The model utilizes partial budgeting techniques and is a single period tool with no dynamic time considerations. Shaffer and Tweeten note the difficulty of estimating the indirect and induced effects at the community level because there are no publshed rural community input-output tables. Two conclusions reached by the authors are that industrial impacts vary over different economic sectors and differ among communities.

Ford (4) presents a computer model that is designed to describe the impacts of locating large power plants near small, isolated communities. Small towns in the western states that experience this type of impact generally go through an initial "boom" period with rapid expansion. Following the initial construction phase, economic and demographic changes tend to level off. Characteristics of the immigrating population during the construction phase are often quite different from the characteristics of the indigenous population. Public service capital and economic activity are often expanded to support the rapid population growth putting a strain on the public sector. Following completion of the energy project, a "bust" period often follows. Tax revenues decrease and the local government is left with excess capacity in the public sector. The BOOM 1 model (4) provides economic, demographic, public service, and fiscal projections of the proposed impacts. Yearly projections for the city of interest are provided. A series of feedback loops are utilized to provide dynamic projections from year to year.

Clayton and Whittington (2) present an impact model developed for use in the state of Florida. The model is an ex ante evaluation of the impacts of community growth. Output includes employment and population change resulting from an outside impact such as a new industry. Private sector impacts include such variables as direct, indirect and induced sales from the impact being analyzed. Public sector impacts include projection of local revenues and expenditures. A net fiscal surplus (deficit) is calculated along with a break-even property assessment ratio. City, county, and school district levels of government are included. The Florida model emphasizes user access with default data provided when local data are unavailable. This type of data availability increases the usefulness of the model and allows more timely analysis.

A more recent model has been developed in North Dakota (6) which is designed specifically to measure the impact of energy developments. The model provides annual impact and baseline projections of key variables. Impacts of energy resource development can be measured for employment, population, settlement patterns, school enrollments, housing requirements, and public sector costs and revenues (2). Like the model for Florida, the North Dakota model is built around the input-output portion of the model. Output is provided at the state, county, city and school district levels. Also, the complex process of interfacing economic projections with population growth is well documented.

Model adaptation is the process of taking a model used in one area and applying it to another area. This process can be successfully accomplished if care is taken to replace original data with more appropriate data for the new area being considered. This can take considerable time, but may be considerably more efficient than developing a new model from "scratch." Examples of model adaptation include a model developed for Virginia (8). The Virginia model draws from the work of Shaffer and Tweeten (11) and provides similar output. Another adaptation is the model developed for Texas (9) which follows the methodology developed in the North Dakota model.

Fox (5) discusses the development of impact models from a user's viewpoint. Governments at all levels are faced with decisions that would be greatly aided by impact model forecasts. Fox emphasizes the fact that user confidence will be enhanced by more accurate and useful models, thus increasing clientele support. For users to utilize models to best advantage, they need to understand the basic model assumptions and structure. If information is clearly communicated to the layman users, then less misinterpretation will occur. Users should be encouarged to ask many questions as necessary to understand the model.

As can be seen from a very brief review of impact models, a wide range of methodologies exists. Some models measure energy resource development impacts, some measure the results of industrial development. Some impact models can also project baseline growth to compare to the resulting growth from some outside impact. Developing new and innovative methodologies is necessary to continually improve the models used. Adaptation of existing models provides additional checks on model validity. Model builders should utilize the 1980 Census results to improve and verify modeling efforts. It is critical for the successful utilization of all impact models to make outputs usable and understandable for decisionmakers. From the viewpoint of an Extension worker, a model which is useful should be: (1) dynamic; (2) community specific; and (3) easy to adapt to each community.

A community impact model has recently been developed at Oklahoma State University (OSU) which relies heavily on the works referenced above (12). To facilitate Extension application, special efforts have been made to make the model dynamic, community specific, and easy to adapt. The OSU model is discussed in detail in the following section.

The OSU Community Impact Model

An aggregate overview of the OSU community impact model is presented in Figure 1. The model has four main sections: an economic account, a capital account, a demographic account and a government account. The economic portion of the model is the driving force of the model. It includes a community-specific input-output model and a gravity model. The gravity model is employed to determine the service area of a community. A location quotient technique is applied to a regional or state input-output model to derive a community specific input-output model. The community model is made dynamic through the use of equations which predict final demand over time.

A capital account allows for the simulation of capital investment and its effects on the economy. The demographic portion of the model is a typical birth, death, population projection model with migration being an equalizer to match up people with available jobs n the economic sector. The government sector estimates the need for services based on community service usage coefficients.

To illustrate the model, a recent application is presented. The community simulation and impact model was applied to the community of Holdenville, Oklahoma. The model simulated values for economic and demographic variables by year from the base year of 1972 to 1991. Projections of employment for selected years are presented in Table 1. Many of the future jobs are expected in the service type sectors of wholesale and retail trade, finance and insurance and educational and professional services. Proprietor employment is projected to increase slightly. The model projects population by age and sex categories. Aggregate data for the community and for the service area are shown in Table 2. Population is projected to increase from 8,756 in 1972 to 11,182 in 1990. The 1980 population was projected at 8,939. Preliminary 1980 census data show a population of 9,201.

The government component, which predicts service needs, is probably the most useful section of the model. Projected community service needs for the Holdenville area are shown in Table 3. Hospital bed days are projected to increase from 16,508 in 1980 to 19,319 in 1990. These estimates are based on estimated population by age and sex and hospital utilization rates for each age and sex category (7). For each community service, detailed research has been completed to facilitate usage prediction based on location conditions.[1] An estimation of general fund revenue which will be available to Holdenville to support additional services and other local government functions was made for each year from 1972 through 1991. Annual revenues for selected years are presented in Table 4.

The data in Tables 1 through 4 reflect growth as is currently occurring in the area and can be referred to as "base run" information. If a new plant or some other development activity was expected, its impact could be simulated. For example, assume a new plant employing 50 workers is expected to locate in Holdenville in 1982. The community simulation and impact model can be run and comparisons of the estimates made with base year estimates to measure the impact of the plant. Selected impacts measured in this way are presented in Table 5. The simulation model projects wage and salary employment to increase by 115 in 1982 and by 210 in 1990 due to the new plant. Likewise, physician visits are projected to increase due to the plant by 744 in 1982 and by 1,233 in 1990.

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[1] For a summary of community service studies, see (3).

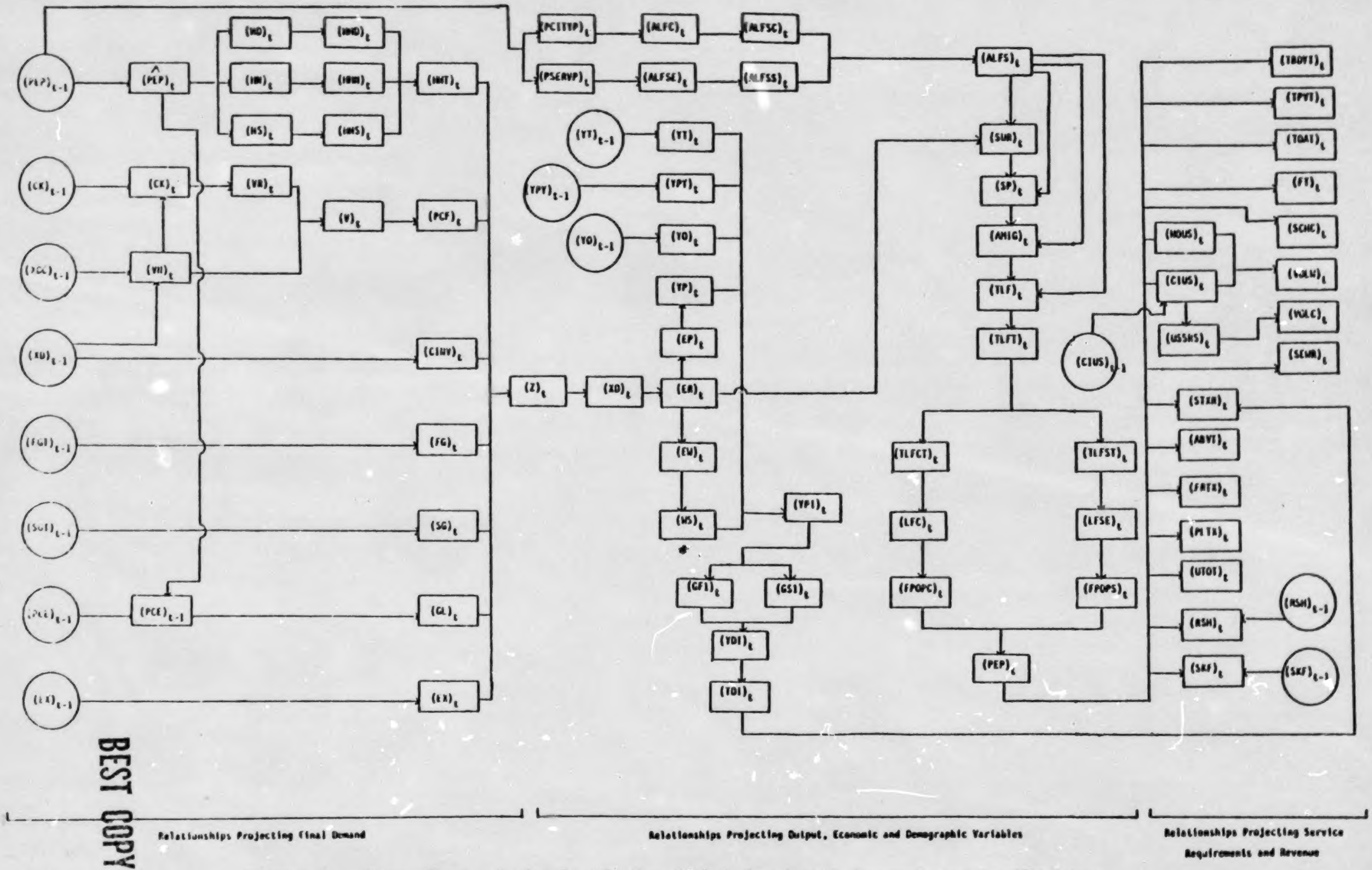
A major function of the OSU community impact model is to allow decisionmakers to estimate the impact of a change in their community's economy on community service needs and community revenues. They can then determine when the capacities of existing systems will be reached and what capacities should be designed into system constructions or renovations. If researchers are to continue serving community decisionmakers, we must constantly strive to improve our abilities to simulate and predict the impacts that changes will have on communities.

The Extension Challenge

Several aspects of the delivery of community impact information to local decisionmakers are critically important to Extension workers. Community simulation and impact models must be easily adaptable to specific communities, and they must be accessible for quick delivery. The OSU community simulation model is programmed with default data. Thus, if local data are not available, values of variables in the model will be used. The model requires base year data for employment, population nd miles from neighboring communities. Once these data are entered, it can be run for any community. Default data can easily be changed if local decisionmakers have more accurate local data.

It is usually important to respond to information needs of local decisionmakers as rapidly as possible. The OSU model is written to facilitate rapid output of informtion which can be readily compiled into a community report. OSU personnel attempt to complete analyses within 2-4 weeks of a request. Then, a computer terminal is taken to the field when the study is presented so that additional community simulation runs can be made if local decisionmakers wish to change certain variables.

Another important element of the successful delivery of information from the OSU community impact model is to leave several copies of the final report with community leaders. This provides them with a reference for future use and also makes them more aware of Extension's services. It is also often seen by community leaders of other communities, resulting in more requests and building Extension's clientele. In summary, as Extension workers, we need to provide (1) community specific analyses; (2) quick responses to community requests; and (3) written reports of results of analyses to each community. Used in this way, community impact models will serve to build an Extension clientele as assistance is given to leaders of rural communities.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Relationships Projecting Output, Economic and Demographic Variables
Relationships Projecting Service Requirements and Revenue

Figure 1. Flow Chart of the Simulation Model for Rural Communities in Oklahoma

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TABLE 1

PROJECTED EMPLOYMENT BY SECTOR FOR HOLDENVILLE, SELECTED YEARS*

Sector	Year 1972	1975	1980	1985	1990
Agriculture, Mining	164	184	220	273	343
Construction	34	62	63	98	156
Manufacturing - Nondurable	178	153	117	109	109
Manufacturing - Durable	1	143	121	142	168
Transportation	25	30	30	34	41
Communication, Utilities	60	43	30	30	31
Wholesale and Retail	252	312	365	493	693
Finance, Insurance and Real Estate	256	298	355	461	616
Educational and Professional Services	629	703	803	989	1262
Total Wage and Salary	1599	1928	2104	2629	3419
Total Proprietor	1112	1161	1106	1125	1133
TOTAL	2711	3089	3210	3754	4552

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*Source (12)

TABLE 2

PROJECTED POPULATION FOR HOLDENVILLE AND SERVICE AREA, SELECTED YEARS*

	1972	1975	1980	1980[A]	1985	1990
Holdenville	5222	5388	5215	5373	5662	6397
Service Area	3534	3723	3724	3828	4152	4785
TOTAL	8756	9109	8939	9201	9814	11182

[A] Preliminary Census Data

* Source (12)

TABLE 3

PROJECTED COMMUNITY SERVICE NEEDS FOR HOLDENVILLE AND SERVICE AREA, SELECTED YEARS*

Community Service	1973	1975	1980	1985	1990
Hospital Bed Days	16,364	17,163	16,508	17,536	19,319
Physician Visits (clinic)	30,744	32,240	31,565	34,535	39,224
Ambulance Calls					
Holdenville	227	240	233	244	261
Service Area	108	118	124	140	162
Total	335	358	357	384	423
Fire Calls					
Holdenville	83	86	84	91	103
Service Area	56	60	60	66	77
Total	139	146	144	157	180
Water[A] (Thousand Gallons per Year)	168,600	176,158	170,764	185,893	209,486
Sewer[A] (Gallons per Day)	519,328	541,656	524,553	569,796	643,512
Solid Waste[A] (Cubic Yards per Week)	389	406	393	427	483

[A] Holdenville community only

* Source (12)

TABLE 4

PROJECTIONS FOR GENERAL FUND REVENUE FOR HOLDENVILLE SELECTED YEARS*

Revenue Source	1973	1975	1980	1985	1990
	Thousands of Current Dollars				
Sales Tax	201	266	448	796	1,457
Alcoholic Beverage Tax	304	317	307	334	377
User Charges and Other	196	208	202	224	474
TOTAL	701	791	957	1,354	2,084

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*Source (12)

TABLE 5

PROJECTED IMPACT FROM 1982 TO 1990 FOR SELECTED YEARS DUE TO NEW PLANT LOCATION IN HOLDENVILLE IN 1982*

	1982	1985	1987	1990
Wage and Salary Employment	115	153	180	210
Population[A]	209	283	320	350
Hospital Bed Days[A]	410	539	596	634
Physician Visits[A]	744	1004	1130	1233
Ambulance Calls[A]	9	12	14	15
Fire Calls[A]	3	4	5	5
Water[A] (Thousand Gallons Per Year)	6802	9144	10284	11856
Sewer[A] (Gallons Per Day)	21022	28450	32065	35414
Solid Waste[A] (Cubic Yards Per Week)	15	22	24	26
General Revenue ($1000)	33	46	55	74

[A] Holdenville Community only

*Source (12)

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RESULTS FOR COMMUNITY IMPACT MODEL CASE STUDY

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Case Study: Community Impact Model

The example presented in this paper for community growth analysis is Holdenville, Oklahoma. Holdenville grew from a population of 5,181 in 1970 to 5,373 in 1980. Local decision-makers have expressed a need for assistance in planning for future growth and change. As a result of inflationary pressures, rapid changes in technology, and trends toward the "New Federalism", local governments are facing new financial pressures. Residents are demanding adequate local services, and hard choices must be made in allocating limited revenues. Useful planning information includes community level projections of population, employment, governmental revenues and most important--community service requirements (water, sewer, solid waste, schools, health care, etc.).

Background Information

Holdenville is located in Hughes County, in Eastern Oklahoma. The town is 74 miles from Oklahoma City and had a 1980 population of 5,373. Hughes County is primarily agricultural with some manufacturing employment. Nearby cities that compete with Holdenville for population and service area include Henryetta, 28 miles, McAlester, 30 miles, Ada, 19 miles, and Seminole, 15 miles.

Problem

In order to anticipate future community needs, local decision-makers need accurate estimates of future community growth. Annual projections are needed for population, employment, income, local government revenue, and community revenue requirements. The bottom line for many local leaders such as councilmen, mayors, city managers, etc., is providing adequate services. This includes water, sewer, solid waste, health care, and schools. Holdenville needs to know what demand is going to be placed on these services over future years and, most important, what year will present capacity levels be reached. Appropriate action can then be taken at an earlier date: Holdenville can anticipate problem areas rather than react to surprise problems.

Community Impact Model

A computer simulation model is used to provide economic and demographic variables over time. The model is built around a data base comprised of various accounts. The accounts provide the input data for the model and consist of: an economic account, a capital account, a demographic account, community service, and revenue accounts. The model provides yearly projections for variables such as employment, population, community revenue, and community service requirements.

A procedure to delineate a service area for local communities is used in the model. A gravity model is employed to analyze population and distance data for the community of interest and competing communities. Employment and income values by sector are estimated through use of the gravity model.

The economic account contains a community-specific input-output model estimated with the use of a location quotient technique. Final demand categories are projected over time and utilized along with the input-output model to project output yearly. This procedure is the driving force of the model. The base I-O table is the 1972 National Table (6).

The capital account provides information on capacity and capital expansion. The capital information allows more realistic projection over time, introducing a dynamic concept into the model. National capital relationships are utilized where necessary local data are not available. The capital equations contained in the simulation model also provide an appropriate entry point for projecting impact results. Capital expansion can be simulated over time, providing a relative comparison to baseline projections.

The demographic account uses an age-sex cohort survival technique to project population. Yearly projections are utilized to estimate the local labor force which in turn is compared to employment requirements provided by the economic account. Migration levels for the community and service area are estimated by comparing labor force data with labor demand in the community.

The community service account is comprised of age-specific usage coefficients for various community services. Levels of demand are estimated for services such as hospital bed days, ambulance, physician visits, fires, water, sewer, and solid waste based on the economic and demographic projections of the model. Community revenue by source is also estimated over time based on published community-specific revenue data and model projections.

The community impact model is written in FORTRAN and compiled on an IBM 370/168 computer. A series of questions are asked in the program allowing the user to respond to community-specific questions and input appropriate data. For a detailed discussion of the computer model see Woods (7).

Data Requirements

The following pages present an example of the data input for the Holdenville example. A Users Guide is also being prepared by the authors to provide detailed instructions for using the model.

As can be seen, the first section provides sector definitions and final demand categories. This information is for the input-output table that will be estimated for the community.

The first set of questions is related to the service area for the community. A set of X,Y coordinates is required for competing communities with the community of interest having coordinates 0,0. Alternately, the service area can be estimated and given directly if the user desires. This is the format used throughout the program with default values given--the user then has the option of changing or adding new data if desired. Growth rates for the local population and labor force participation rates are asked for and the number of years for the model run is also requested.

SAMPLE INPUT DATA

```
EX COMSIM
  ARE YOU READY (YES OR NO)?
YES

-ENTER DECIMAL POINT WITH ALL NUMERICAL ANSWERS.

-------------------------------------------------------------------------
                   SECTORS 1-9 DEFINED
=========================================================================
=========================================================================

SECTOR 1. AGRICULTURE, AND MINING
SECTOR 2. CONSTRUCTION
SECTOR 3. MANUFACTURING--NONDURABLE
SECTOR 4. MANUFACTURING--DURABLE
SECTOR 5. TRANSPORTATION
SECTOR 6. COMMUNICATION, UTILITIES, AND SANITARY SERVICES
SECTOR 7. WHOLESALE AND RETAIL TRADE
SECTOR 8. FINANCE, INSURANCE, BUSINESS, AND REPAIR SERVICES
SECTOR 9. EDUCATIONAL SERVICES
          PUBLIC ADMINISTRATION
          PROFESSIONAL AND RELATED SERVICES,
          AND OTHER INDUSTRIES


-------------------------------------------------
          FINAL DEMAND (1-6) DEFINED
=================================================
=================================================

FD1. PERSONAL CONSUMPTION EXPENDITURES
FD2. CAPITAL FORMATION
FD3. INVENTORY CHANGE
FD4. FEDERAL GOVERNMENT
FD5. STATE GOVERNMENT
FD6. LOCAL GOVERNMENT
  NET EXPORTS
  DO YOU KNOW YOUR COMMUNITY'S SPHERE OF INFLUENCE?  (YES OR NO)
NO
  THE POSITIONS OF THE FOUR CLOSEST TOWNS TO YOU ARE?
    (GIVE THE X THEN THE Y COORDINATE)
  THE QUADRANT POSITION OF TOWN ONE IS?
14.00  15.00
  THE QUADRANT POSITION OF TOWN TWO IS?
21.00  -5.00
  THE QUADRANT POSITION OF TOWN THREE IS?
-9.00  -10.00
  THE QUADRANT POSITION OF TOWN FOUR IS?
-900   6.00
  THE SPANNING AREA IS:       346.077
  THE ANNUAL GROWTH RATE OF LOCAL POPULATION IS:       1.005000
  DO YOU WISH TO CHANGE THIS VALUE?  (YES OR NO)
NO
  THE ANNUAL CHANGE IN LABOR FORCE PARTICIPATION RATES IS.       1.007000
  DO YOU WANT TO CHANGE THE VALUE?
NO
WHAT YEAR DO YOU WISH TO RUN TO?:
1991.
```

The second set of data requested by the computer program relates to economic values. Income and employment by economic sector is requested as well as various summary employment values. These county income and employment values can be supplied by the user and are available from various sources (3,5). Also, population values are requested for the community and service area. The U. S. Census provides population figures by age-sex cohorts to be used here (4).

Final input data requested is for community revenue and various growth rates measures. The community revenue figures should be community specific and for the most recent year available. The growth rate values are related to the employment and income values provided earlier. These values can be made community or county-specific by using the data in (3,5). Additional community-specific information could relate to community service requirements. Extensive research has been conducted for services such as water, sewer, solid waste, health care, and fire protection in Oklahoma (1,2). This information is included in the model to provide estimates of community service need and is a part of the model output.

```
   THE VALUE FOR THE COUNTY INCOME BY SECTORS IS.
 SECTOR 1;
 2.636
 SECTOR 2;
 0.735
 SECTOR 3;
 1.507
 SECTOR 4;
 0.006
 SECTOR 5;
 0.438
 SECTOR 6;
 0.992
 SECTOR 7;
 2.620
 SECTOR 8;
 1.826
 SECTOR 9;
 5.701
   THE VALUES FOR OTHER INCOME MEASURES ARE.
   SECTOR 1
11.219
   SECTOR 2
0.742
   SECTOR 3
4.500
   SECTOR 4
0.796
   SECTOR 5
5.903
   SECTOR 6
21.568
   SECTOR 7
6.629
   SECTOR 8
9.172
   SECTOR 9
37.369
   THE VALUE FOR COUNTY EMPLOYMENT BY ECONOMIC SECTOR IS.
   SECTOR 1
254.
   SECTOR 2
52.
   SECTOR 3
275.
   SECTOR 4
1.
   SECTOR 5
38.
   SECTOR 6
93.
```

```
  SECTOR 7
389.
  SECTOR 8
396.
  SECTOR 9
972.
  WHAT IS THE VALUE FOR TOTAL COUNTY WAGE AND SALARY EMPLOYMENT?
2470.
  WHAT IS THE VALUE FOR PROPRIETOR FARM EMPLOYMENT?
1149.
  WHAT IS THE VALUE FOR PROPRIETOR NONFARM UNEMPLOYMENT?
569.
  WHAT IS THE COUNTY AREA IN SQUARE MILES?
810.
  WHAT IS THE TOTAL COUNTY POPULATION?
13288.
  WHAT IS THE TOTAL COMMUNITY POPULATION?
5099.
  SPROP =  0.42726
  PPROP =   0.38373
  PROP =   0.64703
THE ANNUAL MIGRATION RATE FOR THE COMMUNITY IS    0.01500
DO YOU WISH TO CHANGE IT? (YES OR NO)
NO
THE ANNUAL MIGRATION RATE FOR THE SERVICE AREA IS    0.01800
DO YOU WISH TO CHANGE IT? (YES OR NO)
NO



THE POPULATION FOR THE COMMUNITY BY COHORTS IS
MALE   15
525.
MALE 15-19
167.
MALE 20-29
209.
MALE 30-39
161.
MALE 40-44
105.
MALE 45-49
118.
MALE 50-54
106.
MALE 55-59
167.
MALE 60-64
184.
MALE 65-69
182.
MALE 70-79
255.
MALE 80+
107.
```

```
FEMALE   15
491.
FEMALE 15-19
191.
FEMALE 20-29
265.
FEMALE 30-39
195.
FEMALE 40-44
141.
FEMALE 45-49
157.
FEMALE 50-54
150.
FEMALE 55-59
222.
FEMALE 60-64
257.
FEMALE 65-69
245.
FEMALE 70-79
408.
FEMALE 80+
173.
THE POPULATION FOR THE SERVICE AREA BY AGE COHORTS IS
MALE   15
1030.
MALE 15-19
366.
MALE 20-29
355.
MALE 30-39
325.
MALE 40-44
204.
MALE 45-49
248.
MALE 50-54
232.
MALE 55-59
257.
MALE 60-64
285.
MALE 65-69
237.
MALE 70-79
295.
MALE 80+
109.
```

```
FEMALE   15
952.
FEMALE 15-19
341.
FEMALE 20-29
387.
FEMALE 30-39
394.
FEMALE 40-44
225.
FEMALE 45-49
268.
FEMALE 50-54
277.
FEMALE 55-59
284.
FEMALE 60-64
288.
FEMALE 65-69
255.
FEMALE 70-79
303.
FEMALE 80+
130.
  WHAT IS THE CITY POPULATION FOR YOUR COMMUNITY FOR THE YEARS THAT THE
REVENUE DATA IS FOR?
522.
  THE SALES TAX FOR YOUR COMMUNITY FOR THE MOST RECENT YEAR IS?
210.0299
  WHAT WAS THE ALCOHOL BEVERAGE TAX FOR YOUR COMMUNITY IN THE MOST RECENT YEAR?
31.33454
  WHAT WAS THE OCCUPATION TAX REVENUE FOR YOUR COMMUNITY IN THE MOST RECENT YEAR?
1.044485
  WHAT WAS THE FRANCHISE TAX REVENUE FOR YOUR COMMUNITY IN THE MOST RECENT YEAR?
45.95733
  HOW MUCH REVENUE WAS GENERATED FROM LICENSES AND PERMITS FOR THE MOST RECENT
YEAR?
0.522243
  HOW MUCH REVENUE WAS GENERATED THROUGH COURT FINES?
36.03474
HOW MUCH REVENUE WAS GENERATED FROM OTHER SOURCES?
31.33454
  HOW MUCH REVENUE IS THERE FOR THE STREET AND ALLEY FUND?
55.35771
  THE TOTAL NUMBER OF INDUSTRIES ESTIMATED TO BE IN YOUR COMMUNITY IS?
6.
  HOW MUCH REVENUE WAS GENERATED FROM POLICE SERVICES?
7.311396
  THE AMOUNT OF REVENUE RECEIVED FROM GARBAGE SERVICE WAS?
66.32479
  THE AMOUNT OF REVENUE FROM THE CEMETERY WAS?
7.311396
  THE AMOUNT OF REVENUE FROM THE LANDFILL SERVICE IS?
4.700183
```

```
THE ANNUAL CHANGE IN THE RATIO OF WAGE AND SALARY
EMPLOYMENT TO TOTAL EMPLOYMENT BY SECTOR IS THE FOLLOWING
  A16 SECTOR 1      1.02900
  A16 SECTOR 2      1.01800
  A16 SECTOR 3      1.00000
  A16 SECTOR 4      1.00000
  A16 SECTOR 5      1.01000
  A16 SECTOR 6      1.00500
  A16 SECTOR 7      1.01200
  A16 SECTOR 8      1.01700
  A16 SECTOR 9      1.00800
DO YOU WISH TO CHANGE IT?:
NO
THE ANNUAL GROWTH RATES FOR WAGE RATES IS THE FOLLOWING.
SECTOR 1:       1.28000000
SECTOR 2:       1.04900000
SECTOR 3:       1.06000000
SECTOR 4:       1.10100000
SECTOR 5:       1.10000000
SECTOR 6:       1.08600000
SECTOR 7:       1.03600000
SECTOR 8:       1.10400000
SECTOR 9:       1.06000000
DO YOU WANT TO CHANGE THEM?:
NO
THE ANNUAL GROWTH RATES FOR PROPRIETOR INCOME IS THE FOLLOWING.
SECTOR 1:       1.14500000
SECTOR 2:       1.00800000
SECTOR 3:       1.05500000
SECTOR 4:       1.10000000
SECTOR 5:       1.09000000
SECTOR 6:       1.08200000
SECTOR 7:       1.02000000
SECTOR 8:       1.08000000
SECTOR 9:       1.05000000
DO YOU WISH TO CHANGE THEM ?:
NO
THE ANNUAL INCREASE IN TRANSFER PAYMENTS IS.      1.12440014
DO YOU WISH TO CHANGE IT?  (YES OR NO):
NO
THE ANNUAL GROWTH IN PROPERTY INCOME IS THE FOLLOWING.      1.15100002
DO YOU WISH TO CHANGE IT?:
NO
THE ANNUAL CHANGE IN OTHER LABOR INCOME IS THE FOLLOWING.       1.16559982
DO YOU WISH TO CHANGE IT?:
NO
THE ANNUAL CHANGE FOR THE RATIO OF SOCIAL SECURITY
PAYMENTS TO WAGE AND SALARY INCOME IS THE FOLLOWING.       1.01459980
  DO YOU WISH TO CHANGE THIS VALUE?
NO
```

Sample Model Output

The following section provides an example of the information provided by the community impact model. The information is for the year 1990 only. The model provides annual projections, but only one year was presented to preserve space.

Sector output is provided along with employment and various income measures. Population for the community and service area is provided by age and sex. Several measures of community service needs are provided. Hospital bed days by disease categories for the community and service area and physician visit and ambulance calls by age are provided. An estimate of fires per year is provided as is water, sewer, and solid waste needs. The number of school age children for the community and service area is also provided. Finally, local revenue by source such as sales tax is provided by the model.

SAMPLE OUTPUT - HOLDENVILLE, OK 1990

```
----------------------------------
SECTOR OUTPUT IN MILLIONS
          OF DOLLARS
----------------------------------

SECTOR 1            56.40242
SECTOR 2            15.58116
SECTOR 3            24.56028
SECTOR 4            28.31473
SECTOR 5             4.96156
SECTOR 6             6.59306
SECTOR 7            25.81530
SECTOR 8            87.95008
SECTOR 9            18.54251

                         EMPLOYMENT
---------------------------------------------------------------
                  TOTAL                WAGE AND        PROPRIETOR
                                       SALARY
---------------------------------------------------------------
SECTOR 1          881.                 343.               539.
SECTOR 2          228.                 156.                72.
SECTOR 3          112.                 109.                 3.
SECTOR 4          174.                 168.                 6.
SECTOR 5           48.                  41.                 7.
SECTOR 6           30.                  31.                 0.
SECTOR 7          854.                 693.               162.
SECTOR 8          866.                 616.               250.
SECTOR 9         1356.                1262.                94.
TOTAL            4551.                3419.              1133.


              WAGE AND
         SALARY PAYMENT (IN MILLIONS OF CURRENT DOLLARS)
SECTOR 1             3.27251
SECTOR 2             2.45651
SECTOR 3             1.59386
SECTOR 4             5.33674
SECTOR 5             2.19584
SECTOR 6             1.38858
SECTOR 7             6.31334
SECTOR 8             9.79186
SECTOR 9            17.57728
TOTAL=         49.92648
```

```
     PROPRIETOR
     INCOME (IN MILLIONS OF CURRENT DOLLARS)
SECTOR 1        3.77899
SECTOR 2        0.56188
SECTOR 3        0.03022
SECTOR 4        0.10838
SECTOR 5        0.11462
SECTOR 6        0.0
SECTOR 7        0.70187
SECTOR 8        1.90439
SECTOR 9        0.67925
TOTAL=     7.87959


     TRANSFER
       PAYMENT (IN MILLIONS OF CURRENT DOLLARS)
SECTOR 1        7.84254
SECTOR 2        2.18675
SECTOR 3        4.48358
SECTOR 4        0.01785
SECTOR 5        1.30312
SECTOR 6        2.95137
SECTOR 7        7.79494
SECTOR 8        5.43266
SECTOR 9       16.96143
TOTAL=    48.97421


     PROPERTY
       INCOME (IN MILLIONS OF CURRENT DOLLARS)
SECTOR 1        8.63418
SECTOR 2        2.40748
SECTOR 3        4.93615
SECTOR 4        0.01965
SECTOR 5        1.43466
SECTOR 6        3.24928
SECTOR 7        8.58177
SECTOR 8        5.98103
SECTOR 9       18.67353
TOTAL=    53.91769


     OTHER LABOR
       PAYMENTS (IN MILLIONS OF CURRENT DOLLARS)
SECTOR 1        1.21258
SECTOR 2        0.33811
SECTOR 3        0.69323
SECTOR 4        0.00276
SECTOR 5        0.20148
SECTOR 6        0.45633
SECTOR 7        1.20522
SECTOR 8        0.83998
SECTOR 9        2.62251
TOTAL=     7.57220
```

```
TOTAL PERSONAL INCOME
  LESS SOCIAL INSURANCE (IN MILLIONS OF CURRENT DOLLARS)
  SECTOR 1          24.43940
  SECTOR 2           7.72448
  SECTOR 3          11.59025
  SECTOR 4           4.99387
  SECTOR 5           5.04749
  SECTOR 6           7.91766
  SECTOR 7          24.01567
  SECTOR 8          23.04809
  SECTOR 9          54.89513
  TOTAL=       163.67200


DISPOSABLE PERSONAL
     INCOME (IN MILLIONS OF DOLLARS)
SECTOR 1              21.09120
SECTOR 2               6.66623
SECTOR 3              10.00238
SECTOR 4               4.30971
SECTOR 5               4.35599
SECTOR 6               6.83294
SECTOR 7              20.72553
SECTOR 8              19.89050
SECTOR 9              47.37450
TOTAL=         49.92648


               POPULATION                         1990
------------------------------------------------------
------------------------------------------------------

                         COMMUNITY      SERVICE AREA

------------------------------------------------------
------------------------------------------------------

MALE   15                   633.            494.
MALE 15-19                  216.            170.
MALE 20-29                  430.            349.
MALE 30-39                  387.            319.
MALE 40-44                  176.            146.
MALE 45-49                  157.            130.
MALE 50-54                  138.            115.
MALE 55-59                  127.            108.
MALE 60-64                  119.            101.
MALE 65-69                  111.             92.
MALE 70-79                  176.            131.
MALE 80+                    165.            107.
FEMALE   15                 621.            483.
FEMALE 15-19                211.            165.
FEMALE 20-29                440.            340.
FEMALE 30-39                422.            320.
```

FEMALE 40-44	201.	151.
FEMALE 45-49	188.	141.
FEMALE 50-54	178.	133.
FEMALE 55-59	177.	132.
FEMALE 60-64	182.	132.
FEMALE 65-69	191.	132.
FEMALE 70-79	344.	202.
FEMALE 80+	407.	192.
TOTAL=	6397.	4785.

1990

HOSPITAL BED DAYS

DISEASE CATEGORIES	COMMUNITY	SERVICE AREA	TOTAL
INFECTIVE AND PARASITIC	223.98	149.93	373.92
NEOPLASMS	1364.32	893.55	2257.88
ENDOCRINE, NUTRITIONAL, AND METABOLIC	324.39	210.06	534.45
BLOOD AND BLOOD FORMING SYSTEM	35.08	23.71	58.80
MENTAL DISORDERS	465.16	326.67	791.84
NERVOUS SYSTEM AND SENSE ORGANS	291.52	196.13	487.65
CIRCULATORY SYSTEM	2278.30	1491.84	3770.14
TONSILLECTOMY	44.49	34.01	78.50
RESPIRATORY SYSTEM	1402.91	930.77	2333.68
DIGESTIVE SYSTEM	1356.54	897.10	2253.65
GENITO-URINARY SYSTEM	1154.30	787.23	1941.53
MATERNITY CARE	179.70	137.64	317.34
SKIN AND SUBCUTANEOUS TISSUE	132.41	88.28	220.68
MUSCULO-SKELETAL SYSTEM AND CONNECTIVE TISSUE	781.69	516.88	1298.57
CONGENITAL ANOMOLIES	44.66	32.96	77.62
CERTAIN CAUSES OF PERINATAL MORBIDITY AND MORTALITY	102.55	79.66	182.21
SYMPTOMS AND ILL-DEFINED CONDITIONS	571.09	376.40	947.48
ACCIDENTS, POISONING AND VIOLENCE	835.19	558.54	1393.73
TOTAL	11588.25	7731.35	19319.60

1990

PHYSICIAN VISITS

	COMMUNITY	SERVICE AREA	TOTAL
	2012.76813	1570.89092	3583.65906
	3650.88317	2971.86051	6622.74368
	2045.73900	1715.88683	3761.62583
	1950.89531	1423.19097	3374.08628
	1317.54250	1022.90969	2340.45220
	5055.31823	3872.03222	8927.35045
	2550.73640	1896.22775	4446.96416
	3956.13008	2211.01309	6167.14317
TOTAL	22540.0000	16684.0000	39224.0000

AMBULANCE CALLS

	COMMUNITY	SERVICE AREA	TOTAL
	9.65101	7.52908	17.18009
	14.30297	11.32802	25.63099
	13.01196	10.27399	23.28596
	10.11992	7.96507	18.08499
	16.75675	13.19359	29.95034
	30.07387	22.77405	52.84792
	62.75208	40.21864	102.97072
	190.56232	99.76943	290.33175
TOTAL	347.23071	213.05182	560.28247

1990

FIRES IN CITY = 103
FIRES IN SERVICE AREA = 77
TOTAL FIRES = 180.35905
TOTAL ANNUAL GALLONS OF WATER CONSUMED - 209485120.
SEWAGE (GALLONS PER DAY) = 643511.687
TOTAL VOLUME OF SOLID WASTE PER WEEK (CUBIC YARDS) = 483.04

```
               SCHOOL AGE
AGE        COMMUNITY        SERVICE AREA          TOTAL
=================================================
=================================================

 1            77                51                 128
 1            75                50                 125
 2            71                48                 119
 3            70                50                 121
 4            73                55                 128
 5            80                60                 140
 6            84                65                 149
 7            88                69                 158
 8            90                69                 159
 9            88                72                 160
10            92                77                 169
11            88                73                 162
12            91                76                 167
13            90                78                 168
14            91                78                 170
15            84                79                 164
16            85                76                 161
17            83                74                 157
18            89                59                 149
19            84                45                 129
                                                                  1990

SALES TAX REVENUE =      1688.44336
ALCOHOL BEVERAGE TAX =          38.385773
OCCUPATION TAX =         1.279528
FRANCHISE TAX =          56.299194
  REVENUE FROM PERMITS AND LICENSES =         0.639764
REVENUE FROM POLICE =          8.956693
REVENUE FROM GARBAGE =         81.249969
REVENUE FROM CHARGES FOR CEMETERY =           8.956693
REVENUE FROM LANDFILL =        5.757874
REVENUE FROM COURT FINES =          44.143677
OTHER REVENUE SOURCES =        38.382706
  TOTAL REVENUE IN GENERAL FUND =        1972.49438
                                   RSH =      266.119873    STAREV =    67.814941
```

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COMMUNITY IMPACT MODEL: WORKSHOP EXAMPLE

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Introduction

For this workshop an example problem has been prepared. The hypothetical example will be called Anytown, U.S.A. The community has expressed an interest in planning for future growth as recent history has shown a rapid increase in the economic base and in population. To better anticipate future community service needs the following information was collected by Extension staff members. The data can be used to project community growth to the year 1990.

Background

The community has a 1970 population breakdown according to census figures of the following.

Age - Males	Community	Service Area
15	603	840
15-19	225	420
20-29	220	401
30-39	172	331
40-44	113	220
45-49	127	253
50-54	124	257
55-59	172	268
60-64	197	297
65-69	163	243
70-79	189	317
80+	163	121

Age - Females		
15	504	1001
15-19	241	347
20-29	301	382
30-39	221	401
40-44	163	228
45-49	165	273
50-54	163	284
55-59	237	293
60-64	240	297
65-69	235	267
70-79	306	313
80+	389	142

The community area of influence or service area is estimated to be 650 square miles compared to a total of 898 square miles for the county. The annual growth rate for community population is 1.01006. Income measures by economic sector for the county are the following:

Sector	Income (Millions of Dollars)	Other Income (Millions of Dollars)
1	8.429	15.287
2	1.032	1.260
3	2.478	8.236
4	0.060	1.209
5	0.510	4.207
6	1.203	26.568
7	3.698	6.629
8	2.067	9.172
9	7.301	48.329

County employment by sector is: sector 1, 321; sector 2, 109; sector 3, 367; sector 4, 10; sector 5, 23; sector 6, 102; sector 7, 502; sector 8, 484; and sector 9, 1032. Total county wage and salary employment is 2,950 with proprietor farm employment being 1,308 and non-farm employment being 899.

The total county population is 13,831 for 1970 and community population is 5,653.

Local revenue figures by source for the community were available from local records for the year 1980. The values in thousands of dollars were the following: sales tax, $450.686; alcohol beverage tax, $37.654; franchise tax, $100.028, licenses and permits, $19.623; court fines, $66.409; other sources $19.525; street and alley fund, $62.656. There were no revenues from the occupation tax source or for land fill service. User fee revenue included: police services, $14.023, garbage service, $192.068, and cemetary, $15.272. Local sources indicated there were 11 industries located in the community. The population value for 1980 is estimated to be 6400.

One growth rate needs to be changed in this example. The annual change for the ratio of social security payments to wage and salary income is changed to 1.011. All other growth rate values will use the default values contained in the computer program.

The following pages present an example of the input data needed to successfully run the computer program and sample output for 1990.

COMMUNITY IMPACT MODEL

EXAMPLE__INPUT DATA

```
EX COMSIM
 ARE YOU READY(YES OR NO)?
YES

+ ENTER DECIMAL POINT WITH ALL NUMERICAL ANSWERS.

------------------------------------------------------------------
                  SECTORS  1-9  DEFINED
==================================================================
SECTOR 1.  AGRICULTURE, AND MINING
SECTOR 2.  CONSTRUCTION
SECTOR 3.  MANUFACTURING--NONDURABLE
SECTOR 4.  MANUFACTURING--DURABLE
SECTOR 5.  TRANSPORTATION
SECTOR 6.  COMMUNICATION, UTILITIES, AND SANITARY SERVICES
SECTOR 7.  WHOLESALE AND RETAIL TRADE
SECTOR 8.  FINANCE, INSURANCE, BUSINESS, AND REPAIR SERVICES
SECTOR 9.  EDUCATIONAL SERVICES
           PUBLIC ADMINISTRATION
           PROFESSIONAL AND RELATED SERVICES,
           AND OTHER INDUSTRIES

---------------------------------------------
           FINAL DEMAND (1-6) DEFINED
=============================================
FD1.  PERSONAL CONSUMPTION EXPENDITURES
FD2.  CAPITAL FORMATION
FD3.  INVENTORY CHANGE
FD4.  FEDERAL GOVERNMENT
FD5.  STATE GOVERNMENT
FD6.  LOCAL GOVERNMENT
 NET EXPORTS
 DO YOU KNOW YOUR COMMUNITY"S SPHERE OF INFLUENCE ? (YES OR NO)
YES
 THE AREA OF INFLUENCE IS ?
650.
THE SPANNING AREA IS:          650.000
 THE ANUAL GROWTH RATE OF LOCAL POPULATION IS:     1.005000
 DO YOU WISH TO CHANGE THIS VALUE ? (YES OR NO)
YES
 THE NEW GROWTH IS ?
1.01006
 THE ANUAL CHANGE IN LABOR FORCE PARTICIPATION RATES   IS.    1.007000
 DO YOU WANT TO CHANGE THE VALUE ?
NO
WHAT YEAR DO YOU WISH TO RUN TO?=
1990.
```

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```
 THE VALUE FOR THE COUNTY INCOME BY SECTORS IS.
SECTOR  1;
3.429
SECTOR  2;
1.032
SECTOR  3;
2.478
SECTOR  4;
0.060
SECTOR  5;
0.510
SECTOR  6;
1.203
SECTOR  7;
3.698
SECTOR  8;
2.067
SECTOR  9;
7.301
 THE VALUES FOR OTHER INCOME MEASURES ARE.
 SECTOR  1
15.287
 SECTOR  2
1.260
 SECTOR  3
3.236
 SECTOR  4
1.209
 SECTOR  5
4.207
 SECTOR  6
26.568
 SECTOR  7
6.629
 SECTOR  8
9.172
 SECTOR  9
48.329
 THE VALUE FOR COUNTY EMPLOYMENT BY ECONOMIC SECTOR IS.
 SECTOR 1
321.
 SECTOR 2
109.
 SECTOR 3
367.
 SECTOR 4
10.
 SECTOR 5
23.
 SECTOR 6
102.
 SECTOR 7
502.
 SECTOR 8
484.
 SECTOR 9
1032.
```

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```
 WHAT IS THE VALUE FOR TOTAL COUNTY WAGE AND SALARY EMPLOYMENT?
2950.
 WHAT IS THE VALUE FOR PROPRIETIOR FARM EMPLOYMENT?
1308.
 WHAT IS THE VALUE FOR TOTAL PROPRIETOR NONFARM EMPLOYMENT ?
899.
 WHAT IS THE COUNTY AREA IN SQUARE MILES ?
898.
 WHAT IS THE TOTAL COUNTY POPULATION ?
13831.
 WHAT IS THE TOTAL COMMUNITY POPULATION ?
5653.
 SPROP =    0.72383
 PPROP =     0.40872
 PROP =     0.83671
THE ANUAL MIGRATION RATE FOR THE COMMUNITY IS    0.01500
DO YOU WISH TO CHANGE IT?(YES OR NO)
NO
THE ANUAL MIGRATION RATE FOR THE SERVICE AREA IS    0.01800
DO YOU WISH TO CHANGE IT?(YES OR NO)
NO


THE POPULATION FOR THE COMMUNITY BY COHORTS IS
MALE <15
603.
MALE 15-19
225.
MALE 20-29
220.
MALE 30-39
172.
MALE 40-44
113.
MALE 45-49
127.
MALE 50-54
124.
MALE 55-59
172.
MALE 60-64
197.
MALE 65-69
163.
MALE 70-79
189.
MALE 80+
163.
```

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```
FEMALE <15
504.
FEMALE 15-19
241.
FEMALE 20-29
301.
FEMALE 30-39
221.
FEMALE 40-44
163.
FEMALE 45-49
165.
FEMALE 50-54
183.
FEMALE 55-59
237.
FEMALE 60-64
240.
FEMALE 65-69
235.
FEMALE 70-79
306.
FEMALE 80+
389.
THE POPULATION FOR THE SERVICE AREA BY AGECOHORTS IS
MALE <15
340.
MALE 15-19
402.
MALE 20-29
401.
MALE 30-39
331.
MALE 40-44
220.
MALE 45-49
253.
MALE 50-54
257.
MALE 55-59
268.
MALE 60-64
297.
MALE 65-69
243.
MALE 70-79
317.
MALE 80+
121.
```

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```
FEMALE <15
1001.
FEMALE 15-19
347.
FEMALE 20-29
382.
FEMALE 30-39
01.
FEMALE 40-44
228.
FEMALE 45-49
273.
FEMALE 50-54
284.
FEMALE 55-59
293.
FEMALE 60-64
297.
FEMALE 65-69
267.
FEMALE 70-79
313.
FEMALE 80+
142.
 WHAT IS THE CITY POPULATION FOR YOUR COMMUNITY FOR THE YEARS THAT THE REVENUE D
ATA IS FOR ?
6400.
 THE SALE TAX FOR YOU COMMUNITY FOR THE MOST RECENT YEAR IS ?
450.686
 WHAT WAS THE ACOHOL BEVERAGE TAX FOR YOUR COMMUNITY INTHE MOST RECENT YEAR ?
37.654
 WHAT  WAS THE OCCUPATION TAX REVENUE FOR YOUR COMMUNITY IN THE MOST RECENT YEAR
 ?
0.000
 WHAT WAS THE FRANCHISE TAX REVENUE FOR YOUR COMMUNITY IN THE MOST RECENT YEAR ?
100.028
 HOW MUCH REVENUE WAS GENERATED FROM LICENSES AND PERMITS FOR THE MOST RECENT YE
R ?
9.623
 HOW MUCH REVENUE WAS GENERATED THROUGH COURT FINES ?
6.409
OW MUCH REVENUE WAS GENERATED FROM OTHER SOURCES ?
19.525
 HOW MUCH REVENUE IS THERE FOR THE STREET AND ALLEY FUND ?
2.656
 THE TOTAL NUMBER OF INDUSTIRES ESTIMATED TO BE IN YOUR COMMUNITY IS ?
11.
 HOW MUCH REVENUE WAS GENERATED FROM POLICE SERVICES ?
4.023
 THE AMOUNT OF REVENUE RECEIVED FROM GARBAGE SERVICE WAS ?
192.068
 THE AMOUNT OF REVNUE FROM THE CEMETARY WAS ?
15.272
 THE AMOUNT OF REVENUE FROM THE LANDFILL SEVICE IS ?
.000
```

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```
THE ANUAL CHANGE IN THE RATIO OF WAGE AND SALARY
EMPLOYMENT TO TOTAL EMPLOYMENT BY SECTOR IS THE FOLLOWING.
 A16 SECTOR  1         1.02900
 A16 SECTOR  2         1.01800
 A16 SECTOR  3         1.00000
 A16 SECTOR  4         1.00000
 A16 SECTOR  5         1.01000
 A16 SECTOR  6         1.00500
 A16 SECTOR  7         1.01200
 A16 SECTOR  8         1.01700
 A16 SECTOR  9         1.00800
DO YOU WISH TO CHANGE IT ?:
NO
THE ANUAL GROWTH RATES FOR WAGE RATES IS THE FOLLOWIN G.
SECTOR 1:       1.28000000
SECTOR 2:       1.04900000
SECTOR 3:       1.06000000
SECTOR 4:       1.10100000
SECTOR 5:       1.10000000
SECTOR 6:       1.08600000
SECTOR 7:       1.03600000
SECTOR 8:       1.10400000
SECTOR 9:       1.06000000
DO YOU WANT TO CHANGE THEM ? :
NO
THE ANUAL GROWTH RATES FOR PROPRIETOR INCOME IS THE FOLLOWING.
SECTOR 1:       1.14500000
SECTOR 2:       1.00800000
SECTOR 3:       1.05500000
SECTOR 4:       1.10000000
SECTOR 5:       1.09000000
SECTOR 6:       1.08200000
SECTOR 7:       1.02000000
SECTOR 8:       1.08000000
SECTOR 9:       1. 5000000
DO YOU WISH TO CHANGE THEM ?:
NO
THE ANUAL INCREASE IN TRANSFER PAYMENTS IS.       1.12440014
DO YOU WISH TO CHANGE IT ?(YES OR NO):
NO
THE ANUAL GROWTH IN PROPERTY INCOME IS THE FOLLOWING.      1.15100002
DO YOU WISH TO CHANGE IT ?:
NO
THE ANUAL CHANGE IN OTHER LABOR INCOME IS THE FOLLOWING.      1.16559982
DO YOU WISH TO CHANGE IT ?:
NO
THE ANUAL CHANGE FOR THE RATIO OF SOCIAL SECURITY
PAYMENTS TO WAGE AND SALARY INCOME IS THE FOLLOWING.      1.01459980
 DO YOU WISH TO CHANGE THIS VALUE ?:
YES
THE NEW VALUE IS :
1.01100
```

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```
==================================
SECTOR OUTPUT IN MILLIONS
            OF DOLLARS
==================================
 SECTOR 1         93.60525
 SECTOR 2         36.80657
 SECTOR 3         44.52803                    EXAMPLE OUTPUT   1990
 SECTOR 4         42.99730
 SECTOR 5          5.41550
 SECTOR 6         11.87960
 SECTOR 7         56.73581
 SECTOR 8        172.83689
 SECTOR 9         34.55672
                                 EMPLOYMENT
============================================================
               TOTAL                WAGE AND     PROPRIETOR
                                    SALARY
============================================================
 SECTOR 1      1493.                569.            924.
 SECTOR 2       547.                369.            178.
 SECTOR 3       204.                197.              6.
 SECTOR 4       265.                255.             10.
 SECTOR 5        53.                 45.              8.
 SECTOR 6        55.                 57.              0.
 SECTOR 7      1895.               1522.            373.
 SECTOR 8      1723.               1210.            513.
 SECTOR 9      2540.               2352.            189.
 TOTAL          8775.               6576.           2201.


           WAGE AND
       SALARY PAYMENT(IN MILLIONS OF CURRENT DOLLARS)
 SECTOR 1        22.35555
 SECTOR 2         4.47352
 SECTOR 3         3.56399
 SECTOR 4         8.11216
 SECTOR 5         4.69740
 SECTOR 6         2.76841
 SECTOR 7        15.89559
 SECTOR 8        13.48835
 SECTOR 9        40.29714
 TOTAL=    121.65204



       PROPRIETOR
       INCOME(IN MILLIONS OF CURRENT DOLLARS)
 SECTOR 1        13.57143
 SECTOR 2         0.76716
 SECTOR 3         0.05734
 SECTOR 4         0.13980
 SECTOR 5         0.20938
 SECTOR 6         0.0
 SECTOR 7         1.46469
 SECTOR 8         2.99483
 SECTOR 9         1.35878
 TOTAL=     20.56337
```

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```
       TRANSFER
         PAYMENT(IN MILLIONS OF CURRENT DOLLARS)
   SECTOR 1        19.93479
   SECTOR 2         2.44070
   SECTOR 3         5.86053
   SECTOR 4         0.14190
   SECTOR 5         1.20616
   SECTOR 6         2.84512
   SECTOR 7         8.74586
   SECTOR 8         4.88850
   SECTOR 9        17.26704
   TOTAL=     63.33057



       PROPERTY
         INCOME(IN MILLIONS OF CURRENT DOLLARS)
   SECTOR 1        21.94702
   SECTOR 2         2.68707
   SECTOR 3         6.45209
   SECTOR 4         0.15623
   SECTOR 5         1.32791
   SECTOR 6         3.13231
   SECTOR 7         9.62867
   SECTOR 8         5.38195
   SECTOR 9        19.00998
   TOTAL=     69.72318



       OTHER LABOR
         PAYMENTS(IN MILLIONS OF CURRENT DOLLARS)
   SECTOR 1         5.23398
   SECTOR 2         0.64082
   SECTOR 3         1.53871
   SECTOR 4         0.03726
   SECTOR 5         0.31668
   SECTOR 6         0.74700
   SECTOR 7         2.29627
   SECTOR 8         1.28350
   SECTOR 9         4.53355
   TOTAL=     16.62778



  TOTAL PERSONAL INCOME
   LESS SOCIAL INSURANCE(IN MILLIONS OF CURRENT DOLLARS)
   SECTOR 1        80.88996
   SECTOR 2        10.57848
   SECTOR 3        17.12946
   SECTOR 4         7.80616
   SECTOR 5         7.30518
   SECTOR 6         9.22625
   SECTOR 7        36.50035
   SECTOR 8        32.16044
   SECTOR 9        78.58595
   TOTAL=    280.18213
```

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 DISPOSABLE PERSONAL
        INCOME(IN MILLIONS OF DOLLARS)
 SECTOR 1        69.80804
 SECTOR 2         9.12923
 SECTOR 3        14.78272
 SECTOR 4         6.73672
 SECTOR 5         6.30437
 SECTOR 6         7.96226
 SECTOR 7        31.49980
 SECTOR 8        27.75446
 SECTOR 9        67.81967
 TOTAL=     121.65204


                                                                     1990
                     POPULATION
==============================================
                       COMMUNITY    SERVICE AREA
==============================================
MALE <15                  1000.          1114.
MALE 15-19                 344.           373.
MALE 20-29                 698.           771.
MALE 30-39                 626.           734.
MALE 40-44                 284.           345.
MALE 45-49                 249.           315.
MALE 50-54                 214.           283.
MALE 55-59                 195.           267.
MALE 60-64                 180.           250.
MALE 65-69                 168.           229.
MALE 70-79                 256.           327.
MALE 80+                   229.           266.
FEMALE <15                 952.          1175.
FEMALE 15-19               322.           403.
FEMALE 20-29               678.           326.
FEMALE 30-39               662.           772.
FEMALE 40-44               318.           363.
FEMALE 45-49               299.           338.
FEMALE 50-54               283.           319.
FEMALE 55-59               279.           315.
FEMALE 60-64               285.           318.
FEMALE 65-69               295.           318.
FEMALE 70-79               496.           490.
FEMALE 80+                 586.           470.

 TOTAL=                    9898.         11382.
                                                                     1990
```

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```
FIRES IN CITY =        159
FIRES IN SERVICE AREA =        183
TOTAL FIRES =        343.22729
 TOTAL ANUAL GALLONS OF WATER CONSUMED =  327223296.
SEWAGE (GALLONS PER DAY) =  997202.312
 TOTAL VOLUME OF SOLID WASTE PER WEEK (CUBIC YARDS)=         750.34
                SCHOOL AGE
AGE  COMMUNITY          SERVICE AREA         TOTAL
==================================================================
<1        120                120               240
1         117                117               235
2         111                113               224
3         110                118               229
4         114                129               243
5         125                140               266
6         130                153               284
7         137                163               301
8         140                162               303
9         137                169               307
10        143                180               324
11        137                172               310
12        142                178               321
13        140                183               323
14        142                184               326
15        131                184               316
16        132                176               309
17        130                171               301
18        139                138               277
19        131                104               236
                                                                      1990
SALE TAX REVENUE =     3661.97681
ALCOHOL BERVERAGE TAX =       58.234390
OCCUPATION TAX =        0.0
FRANCHISE TAX =      154.699890
 REVENUE FROM PERMITS AND LIICENSES =       30.348267
REVENUE FROM POLICE=       21.687485
REVENUE FROM GARBAGE=      297.045654
REVENUE FROM CHARGES FOR CEMETARY =       23.619156
REVENUE FROM LANDFILL =        0.0
REVENUE FROM COURT FINES=      102.705887
THER REVENUE SOURCES =       59.388138
 TOTAL REVENUE IN GENRAL FUND  =     4409.69922
                               RSH=     411.757568 STAREV=      96.901642
```

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HOSPITAL BED DAYS

DISEASE CATEGORIES	COMMUNITY	SERVICE AREA	TOTAL
INFECTIVE AND PARASITIC	338.39	360.53	698.92
NEOPLASMS	2028.61	2177.62	4206.23
ENDOCRINE,NUTRITIONAL,AND METABOLIC	484.61	509.40	994.01
BLOOD AND BLOOD FORMING SYSTEM	52.76	57.26	110.03
MENTAL DISORDERS	706.08	787.79	1493.87
NERVOUS SYSTEM AND SENSE ORGANS	439.09	473.19	912.29
CIRCULATORY SYSTEM	3370.53	3643.66	7014.20
TONSILLECTOMY	69.28	80.57	149.85
RESPIRATORY SYSTEM	2092.74	2259.29	4352.03
DIGESTIVE SYSTEM	2031.07	2174.48	4205.54
GENITOURINARY SYSTEM	1740.63	1909.70	3650.33
MATERNITY CARE	279.45	333.60	613.05
SKIN AND SUBCUTAEOUS TISSUE	199.46	212.37	411.82
MUSCULOSKELETAL SYSTEM AND CONNECTIVE TISSUE	1175.58	1248.51	2424.09
CONGENITAL ANOMOLIES	68.84	78.60	147.44
CERTAIN CAUSES OF PERINATAL MORBIDITY AND MORTALITY	157.56	192.47	350.03
SYMPTOMS AND ILL-DEFINED CONDITIONS	855.81	911.61	1767.42
ACCIDENTS, POISONING AND VIOLENCE	1257.26	1346.15	2603.41
TOTAL	17347.72	18756.77	36104.49

1990

PHYSICIAN VISITS

	COMMUNITY	SERVICE AREA	TOTAL
	3181.26590	3542.13127	6723.39717
	5891.21664	6712.21981	12603.43645
	3170.48731	4218.87834	7389.36565
	2814.72237	3543.13198	6357.85435
	2017.31334	2491.26107	4508.57440
	7861.24938	9385.12069	17246.37007
	4036.05035	4542.70003	8578.75038
	5782.40886	5366.75672	11149.16558
TOTAL	34754.6953	39802.1797	74556.8750

AMBULANCE CALLS

	COMMUNITY	SERVICE AREA	TOTAL
	15.02553	17.59197	32.61750
	22.61457	26.25563	48.87020
	20.73979	24.23762	44.97741
	16.10118	19.08135	35.18253
	26.26277	32.02365	58.28642
	46.30054	55.59657	101.89712
	90.71525	98.52054	189.23579
	271.58024	245.30029	516.88052
TOTAL	509.33960	518.60718	1027.94678

1990

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EVALUATION
IMPACT ANALYSIS WORKSHOP
UNIVERSITY OF KENTUCKY
May 24-26, 1982

QUESTION: "I felt the strong points of the workshop were...."

ANSWERS:

This is one of a very few workshops I have attended that lived up to its promise. The faculty members were knowledgeable, made relevant presentations, represented a good mix of perspectives, and created an open and productive atmosphere for the exchange of ideas. I came away knowing much more about the state of the art in community impact analysis than I did before. Over all, the workshop was a very positive experience.

1) The range of experts available.
2) Bringing in an expert from outside the land-grant system.

The workshop was very well organized so that people not familiar with impact analysis could get an understanding of the work that has been done at various universities on building community impact analysis models. It allowed personnel from various institutions to share ideas on future impact analysis work.

1) Emphasis on application
2) Hands-on demonstrations.

"Hands-on" experience with computer and impact models was very important. Presentations included a good "state of the art" coverage of many models being used. Useful points covered included the transferability among states and the issues to consider when choosing an impact model for your state. Also, the workshop provided a good chance for interaction with other extension specialists - their experiences with developing and delivering program materials similar to mine.

1) The hands-on experience
2) The ample opportunity for one-on-one discussion about the models, their use and modification.
3) The formal presentations were well aimed and targeted at the audience.
4) The after hours fellowship was excellent and contributed to the workshop's success.

Going through the actual computer process of punching raw data and developing an analysis.

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1) Timely topic
2) Assembled the right people
3) Excellent hands-on experience
4) Program unfolded skillfully, so as not to leave anybody behind.

The opportunity to learn of the various approaches taken by several states to the community impact problem was most useful. We had a chance to interact with our colleagues. Also I liked to actually sit down at the terminal and try it.

QUESTION: "I felt the areas where the workshop or future workshops could be improved were...."

ANSWERS:

Plans for follow-up.

I don't see how it could be improved.

Run Tuesday through Thursday so that travel can be on Moday and Friday.

Survey needs and interests of participants beforehand.

More time for evaluation, comments, interaction on the final day-after the workshop problems and demonstrations.

Perhaps a session could be arranged where each participant could seek advice or have discussion on particular areas that are unique to their individual project.

1) Spend more time on computers.
2) Spend more time interpreting results of models.

QUESTION: "I felt the facilities were:

ANSWERS:

__7__ Excellent __3__ Above Average _____Average _____Poor

Comments:

It takes time to find your way around in the Campbell House. Very convenient to UK. I enjoyed the extra activities.

More communication needed concerning facility requirements for workshops presentations. Phones, electrical outlets, classrooms, etc. Overall evaluation: The workshop was very useful to me and I feel it was quite a success.

The high quality of this workshop speaks well for what the Southern Rural Development Center can contribute to practitioners and researchers in the South.

I enjoyed the conference very much. Thank you for the invitation.

Excellent conference.

The SRDC is one of four regional rural development centers in the nation. It coordinates cooperation between the Research (Experiment Station) and Extension (Cooperative Extension Service) staffs at land-grant institutions in the South to provide technical consultation, research, training, and evaluation services for rural development. This publication is one of several published by the Center on various needs, program thrusts, and research efforts in rural development. For more information about SRDC activities and publications, write to the Director.

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